St. Anne-Nackawic Pulp Co. Ltd.

York License 8

Management Plan - 2002-2026

103-05455/

THE YORK LICENSE # 8
2002-2026 MANAGEMENT PLAN

REPORT

Prepared By: St. Anne-Nackawic Pulp Company Ltd.
January 31, 2002

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January 31, 2002

Mr. Jeff Patch
Regional Resource Manager
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P.O. Box 6000
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Dear Mr. Patch;

St. Anne-Nackawic Pulp Company Ltd. submits the final portion of the 2002 Management Plan for License 8 in partial fulfilment of its obligations to Forest Management Planning on the York License.

Mr. James Donald (RPF), Forest Management Planner, St. Anne-Nackawic Pulp Company Ltd., Woodlands Division, prepared this portion of the 2002 Forest Management Plan. He worked under the supervision of Fred Somerville (RPF), Manager of Forestry.

On behalf of St. Anne-Nackawic Pulp Company Ltd., I want to thank you and your staff, as well as the staff of Timber Management Branch for the assistance received during our preparation of this portion of the 2002, Forest Management Plan for the York License. We await your approval of this submission.

Yours truly

St. Anne-Nackawic Pulp Company Ltd.
Woodlands Division

Rex Brown
Vice President Woodlands

EXECUTIVE SUMMARY

Following requirements of the New Brunswick Crown Lands and Forests Act, St. Anne-Nackawic Pulp Company Ltd. has prepared the blocked portion of the 2002 management plan for Crown Timber License 8. The proposal forecasts timber, vegetation community and habitat supply for 80 years and spatially references OSFH habitat for a minimum of 35 years. The plan addresses objectives for a number of values as detailed in the document "A Vision for New Brunswick Forests". These objectives include:

PUBLIC VALUES AND USES

- **Public Input:** Public meetings were held in 5 locations in fall of 2000 to discuss forest management objectives and the management plan proposal for the License.

- **Recreation:** Existing recreational sites on the License are maintained.

FOREST ECOSYSTEMS

- **Vegetation Communities:** The minimum levels identified for the pure tolerant hardwood (THP), tolerant hardwood/softwood mix (THSW), spruce (SP), black spruce (BS), Cedar (EC) and Pine (PINE) have been maintained over the 80-year planning horizon.

- **Unique Sites:** Identified unique sites of ecological, historical, cultural or scenic value are protected and preserved.

WILDLIFE HABITAT

- **Old Spruce-Fir Habitat (OSFH):** The minimum level of 420 hectares identified for ecoregion 7 does not exist at present due to fragmentation of the forest from past natural and human disturbance. An area was identified that will provide 420 hectares of OSFH in the future. The area identified will be restricted from harvest blocking and scheduling. The present area requirement for ecoregion 7 was transferred to ecoregion 5. In ecoregion 5, the areas identified as Mature Coniferous Forest Habitat (MCFH) in the 1997 management plan provide the best OSFH on the License. The areas identified to provide OSFH on the License do not meet the combined ecoregion 5 and 7 objective in period 1 and 2; however, the OSFH objective of 7,140 hectares is met or surpassed from period 3 to 7. By mutual agreement (DNRE and Licensee), the selected blocks are the best blocks to meet the license OSFH objective.

- **Other Habitat Types:** The minimum levels identified for Old Hardwood Habitat (OHWH), Old Mixedwood Habitat (OMWH), Old Tolerant Hardwood Habitat (OTHH), Large Mixedwood Habitat (LMWH), and Old Pine Habitat (OPIH) have been maintained over the 80-year planning horizon.

- **Deer Wintering Areas:** All interventions in identified Deer Wintering Areas (DWA) are to maintain and enhance, present and future levels of habitat. Timber harvest is secondary. DWA Management plans are produced prior to any intervention. Areas (presently unidentified) with signs of DWA potential are reserved from harvest until potential for habitat can be assessed. At present, there are 109 DWAs covering 26,114 ha (24,461 ha productive), which provide 9,077 hectares of Severe Winter Deer Habitat (SWDH) and 7,981 hectares of Moderate Winter Deer Habitat (MWDH).

TIMBER

- **Timber:** The long-term sustainable timber supply is maximised after meeting all other objectives.

- **Tolerant Hardwood:** All tolerant hardwood stands, with the potential for sawlog production, are managed using uneven-aged management techniques.

- **Harvest Prescriptions:** A full range of harvest prescriptions was investigated.

WATER

- **Watercourse Buffers:** A buffer of vegetation is left on both sides of any watercourse 0.5 meters and wider to protect water quality and aquatic habitat.

RECREATION & AESTHETICS

- **Aesthetic Buffers:** Buffer zones 30 metres wide are left on all numbered provincial highways. Buffer zones 60 metres and wider are left on watercourses with high recreational use.

The Management Plan proposal details how these objectives have been addressed, and as shown in the following table defines sustainable timber volumes that can be harvested annually on License 8.

Table 1. Summary of 2002 -2007 spatial annual harvest levels on License 8.

LANDBASE	VOLUME				
	SPRUCE, FIR & JACK PINE (M^3/YR)	HARDWOOD (M^3/YR)	CEDAR (M^3/YR)	PINE (M^3/YR)	HEMLOCK (M^3/YR)
GENERAL FOREST*	129,900	136,300	15,700	5,700	5,200
BUFFERS	2,000	100	0	0	0
DWAMU**	18,600	20,500	0	1,100	0
OSFH**	2,900	2,700	0	1,900	0
TOTAL	***153,400***	***159,600***	***15,700***	***8,700***	***5,200***

* General Forest harvest level for SP/BF is a 4 period average for SP/BF harvest from total forest less period one harvest from DWAMU and OSFH. General Forest harvest level for Hardwood is a 5 period average for hardwood harvest from total forest less period one harvest from DWAMU and OSFH.

** Cedar, Pine, Hemlock, DWAMU and OSFH (SP/BF and Hardwood) are period one levels.

Table 2. Summary of 2002 -2007 spatial annual harvest levels (after net down) on License 8.

LAND BASE	VOLUME				
	SPRUCE, FIR & JACK PINE (M^3/YR)	HARDWOOD M^3/YR	CEDAR M^3/YR	PINE M^3/YR	HEMLOCK M^3/YR
GENERAL FOREST	118,300	136,300	14,300	5,200	4,700
BUFFERS	2,000	100	0	0	0
DWAMU	16,900	20,500	0	1,000	0
OSFH	2,600	2,700	0	1,700	0
TOTAL	***139,800***	***159,600***	***14,300***	***7,900***	***4,700***

Net Down: All Excluding Hardwood 8.9%.

Table 3. Summary of 2002-2007 annual silviculture levels on License 8.

Landbase	Silviculture	
	Planting (ha)	Spacing (ha)
General Forest *	305	1,280
Buffers	0	0
DWAMU**	10	75
OSFH**	10	15
Total	***325***	***1,370***

* General Forest levels are a 5 period average.
** DWAMU and OSFH are 1st period levels.

TABLE OF CONTENTS

Letters of Submission from Licensee ii
Executive Summary iii
Table of Contents vii
List of Tables x
List of Figures xii

1.0 Background 1
1.1 Requirements of the Crown Lands and Forests Act 1
1.2 Summary of the 1997 Management Plan 1
1.3 Management Planning Objectives for 2002 2
1.4 Public Input 4
1.5 Management Planning Procedures 7

2.0 Present Land Base Description 8
2.1 Forest Inventory 8
2.1.1 Area Description 8
2.1.2 Age Class Distribution 11
2.2 Forest Stratification 12
2.3 Yield Curves 12
2.4 Description of Harvest and Silviculture Treatments 13
2.5 Post Treatment Regeneration Response 13

3.0 General Forest 16
3.1 Objectives 16
3.2 Silviculture Impacts on Annual Allowable Cut (AAC) 16
3.3 Sustainable Harvest Levels (General Forest) 17
3.3.1 Blocking Strategy 17
3.3.2 Sustainable Harvest Levels (Spatial) 19
3.4 Summary of Harvest Treatments (General Forest) 20
3.5 Summary of Silviculture Treatments (General Forest) 22
3.6 Operable Growing Stock 23
3.6.1 Hardwood Growing Stock 23
3.6.2 Softwood Growing Stock 24
3.7 Softwood Dominated Strata 25
3.7.1 Objectives 25
3.7.2 Harvest Prescriptions 25
3.8 Hardwood Dominated Strata 27
3.8.1 Objectives 27
3.8.2 Harvest Prescriptions 27
3.8.2.1 Intolerant Hardwood Dominated Strata 28
3.8.2.2 Tolerant Hardwood Dominated Strata 28
3.9 Cedar Dominated Strata 30
3.9.1 Objectives 30
3.9.2 Harvest Prescriptions 30
3.10 Pine Dominated Strata 31

3.10.1 Objectives 31
3.10.2 Harvest Prescriptions 31
3.10.2.1 White Pine 31
3.10.2.2 Red Pine 32
3.11 Hemlock Dominated Strata 32
3.11.1 Objectives 32
3.11.2 Harvest Prescriptions 32

4.0 Old Spruce/Fir Habitat 34
4.1 Objectives and General Description 34
4.1.1 Background 34
4.1.2 OSFH Objectives 34
4.2 OSFH Management Strategy 35
4.2.1 Net OSFH and Wood Supply Summary 37
4.3 Gross OSFH Objective and Supply 38
4.4 Age Class Structure for the OSFH Landbase 38

5.0 Deer Wintering Areas 40
5.1 Objectives 40
5.2 Landbase Description 40
5.3 Habitat and Wood Supply 41
5.3.1 Landbase 1: North of the St. John River 43
5.3.2 Landbase 2: South of the St. John River 44

6.0 Watercourse Buffers 46
6.1 Buffer Widths by Feature 46
6.2 Harvest Prescription 46
6.3 Summary of Harvest Volumes 47

7.0 Recreation 48

8.0 Unique Sites 49

9.0 Long Term Forest Indicators 50
9.1 Vegetation and Habitat Community Objectives 50
9.1.1 Discussion 50
9.2 Piece Size 51
9.3 Harvest Prescriptions 52

10.0 Discussion 54
10.1 Problems arising since the 1997 Management Plan 54
10.2 Summary of Major Changes from 1997 to 2002 55
10.3 Comparison of 2002 results to 1997 57
10.3.1 Timber 57
10.3.2 Tolerant Hardwood 61
10.3.3 Cedar and Pine 62
10.3.4 Buffers 63

10.3.5 Wildlife Habitat 63
10.3.6 Vegetation and Habitat Objectives 63
10.3.7 Recreation 63
10.3.8 Unique Sites 63
10.4 Conclusion 63

Appendices
Appendix 1: 2002 Forest Management Goals and Objectives
"A Vision for New Brunswick Forests" 64
Appendix 2: Stratum and Yield Curve Development 111
Appendix 3: Stratum Availability for Treatments 127
Appendix 4: Old Spruce/Fir Forest Habitat 138
Appendix 5: Deer Wintering Areas 156
Appendix 6: Vegetative Community and Habitat Levels 163
Appendix 7: Public Meeting Comments 166
Appendix 8: Net Down 169
Appendix 9: Hardwood Volume Adjustment 173
Appendix 10: Volume and Area Adjustments 176
Appendix 11: Blocks Summary 180

LIST OF TABLES

Table 1 Summary of 2002 –2007 spatial annual harvest levels on License 8 v

Table 2 Summary of 2002 –2007 spatial annual harvest levels (after net down) on License 8 v

Table 3 Summary of 2002 –2007 annual silviculture levels on License 8 vi

Table 1.1 Summary of 1997 - 2002 spatial harvest levels from License 8. 2

Table 1.2 Minimum Level of old successional stage maintained in vegetation communities and period when minimum level occurs 5

Table 2.1 Harvest and silviculture treatments utilised on License 8 14

Table 2.2 Transition Matrix for License 8 for various pre-cut cover types 15

Table 3.1 Immediate increase in softwood AAC (aspatial) that is possible using various silviculture levels (annual) on License 8 17

Table 3.2 Immediate increase in hardwood AAC (aspatial) that is possible using various silviculture levels (annual) on License 8 17

Table 3.3 Summary of Spatial Harvest Levels (m^3/period) in the General Forest on License 8 20

Table 3.4 Summary of Spatial Commercial Thinning Levels (ha/period) in the General Forest on License 8. 20

Table 3.5 Summary of Spatial Selection Levels (ha/period) in the General Forest on License 8. 21

Table 3.6 Summary of Spatial Strip Cut Levels (ha/period) in the General Forest on License 8 21

Table 3.7 Summary of Spatial Two-Pass Shelterwood Harvest Levels (ha/period) in the General Forest on License 8 22

Table 3.8 Summary of Spatial Clearcut Levels (ha/period) in the General Forest on License 8 22

Table 3.9 Average Harvest Block Opening Size in General Forest on License 22

Table 3.10 Summary of Silviculture Levels (ha/period) in General Forest on License 8 23

Table 4.1 Future OSFH block in Ecoregion 7 Three Tree Creek 35

Table 4.2	Summary of Net OSFH Supply, Periodic Aspatial Wood Supply, and Harvest Interventions within the OSFH Landbase	37
Table 5.1	DWA Harvest, Silviculture and Habitat Levels North of the St. John River	43
Table 5.2	DWA Harvest, Silviculture and Habitat Levels South of the St. John River	44
Table 5.3	Projected SWDH Area from Actual DWA Management Plans.	45
Table 5.4	Projected SWDH for the Whole DWA Landbase Area from Actual DWA Management Plans	45
Table 6.1	Mapped buffer widths by feature type on License 8.	46
Table 6.2	Annual Allowable Cut from Buffers on License 8.	47
Table 9.1	Vegetation and Habitat Objectives.	51
Table 10.1	Comparison of 1997 and 2002 Spatial Annual Allowable Cut (before net down) for License 8.	59
Table 10.2	Comparison of 1997 and 2002 Spatial Spruce, Fir, Jack Pine Annual Allowable Cut (before net down) for Total Forest.	60
Table 10.3	Comparison of 1997 and 2002 Spatial Hardwood Annual Allowable Cut (before net down) for Total Forest.	60
Table 10.4	Comparison of 1997 and 2002 Spatial Annual Allowable Cut (after Net Down) for Total Forest.	62
Table 10.5	Comparison of 1997 and 2002 Spruce, Fir, Jack Pine Spatial Annual Allowable Cut (after Net Down) for Total Forest	62

LIST OF FIGURES

Figure 2.1 Location of Crown Timber License 8 in New Brunswick 9

Figure 2.2 Summary of total area by land classification for License 8 9

Figure 2.3 Summary of productive forest area by primary objective for License 8 10

Figure 2.4 Summary of productive forest area by cover types for License 8 11

Figure 2.5 Age-class structure for the softwood and hardwood forest on License 8 12

Figure 3.1 Operable Hardwood growing stock (general forest) and spatial harvest level (total forest) over 80 years for License 8 24

Figure 3.2 Operable Softwood growing stock (general forest) and spatial harvest level (total forest) over 80 years for License 8 25

Figure 4.1 Gross OSFH objective and supply on License 8 (aspatial) 39

Figure 4.2 Age Class Distribution for the OSFH Landbase 39

Figure 5.1 Age Class Distribution for the Total DWA landbase 40

Figure 5.2 Severe Winter Deer Habitat for DWA landbase 42

Figure 5.3 Moderate Winter Deer Habitat for DWA landbase 42

Figure 9.1 Average Piece Size of Harvested Spruce – Fir 52

1.0 BACKGROUND

1.1 Requirements of the Crown Lands and Forests Act

Management of Crown lands in New Brunswick is governed by the Crown Lands and Forests Act. The Act was adopted in 1980 and provides for the division of provincial Crown forest lands into 10 Timber Licenses, each of which is assigned to one of the larger forest-based companies in the Province. The Act is administered by the New Brunswick Department of Natural Resources and Energy (DNRE) and requires, among other things, that Licensees prepare management plans that describe how the License will be managed for both timber and non-timber resources. Sustainable supplies of timber are determined for an 80-year period and the source of that sustainable supply is mapped for a minimum of 25 years to ensure its availability. The first management plans were prepared in 1982 and are required to be revised every 5 years. From these management plans annual operating plans are developed that show how the management plan will be implemented each year "on the ground".

Each management plan is scrutinised by DNRE and approved by the Regional Resource Manager. In addition, every 5 years, coinciding with the revision of the management plan, Licensees are evaluated on the success of their management efforts to meet forest-level objectives as described in the management plan.

The management plan proposal contained in this document has been prepared by St. Anne-Nackawic Pulp Company Ltd. (Licensee) and describes the management strategy for the York License 8 for the next 80 years. This management plan is set to begin on April 1, 2002.

1.2 Summary of the 1997 Management Plan

The previous management plan for License 8 was prepared in 1997 and incorporated a new objective for the management of biodiversity. It also included significant objectives for the management of wildlife habitat. These include objectives for Deer Wintering Areas (DWA) and Mature Coniferous Forest Habitat (MCFH), which had been established in 1992. In addition watercourse buffers were widened, and ecological reserves and protected areas were identified. With inclusion of these objectives, the 1997 sustainable softwood harvest levels, after harvest blocking on License 8, remained the same as reported in the previous 1992 plan. Table 1.1 summarises the 1997-harvest level from License 8, by species group and by Landbase. The table includes both the primary volumes and the secondary "fallout" volumes from each Landbase, as well as volumes derived from special management areas (MCFH, DWA and buffers).

Table 1.1. Summary of 1997 - 2002 spatial harvest levels from License 8.

LANDBASE	PRIMARY VOLUME AND FALLOUT			
	SPRUCE, FIR & JACK PINE (M^3/yr)	HARDWOOD (M^3/yr)	CEDAR (M^3/yr)	PINE (M^3/yr)
Spruce, Fir & Jack Pine Forest	80,500	58,500	11,300	4,400
Hardwood Forest	42,100	91,500	3,600	3,700
Buffers	1,000	100	-	-
DWAMU	8,800	7,200	-	-
MCFH	850	1,200	-	-
TOTAL	**133,250**	**158,500**	**14,900**	**8,100**

1.3 Management Planning Objectives for 2002

The 2002 goals and objectives for Crown land management are described in the document entitled "A Vision for New Brunswick Forests", which is included in Appendix 1. This document describes a range of objectives for Crown land management including those of biological, environmental, social and economic importance. It is linked to Canada's Forest Accord, a national document that describes objectives for maintaining the sustainability of Canada's forests.

Outlined in "A Vision for New Brunswick Forests" are a number of specific objectives with operational requirements that must be addressed in the 2002 management plan. These include:

TIMBER

- New Brunswick is very dependent on its forest industry to sustain economic benefits. To satisfy this requirement there are objectives that call for the long-term sustainable timber supply to be maximised after meeting the other non-timber objectives described below. Given the current age structure of the Crown forest, it is necessary to harvest the oldest, fastest declining stands first so as much natural mortality as possible can be captured. These requirements are further described in Section 3.0.

ALTERNATE HARVEST TREATMENTS

- *Tolerant Hardwood:* To maximise product quality requires that all tolerant hardwood stands, with the potential for sawlog production, be managed using uneven-aged management techniques. Implementation of this objective is discussed in Section 3.8.

- *Pine:* To ensure availability of red pine poles and sawlogs, and white pine sawlogs in the future all mature pine stands will be managed using uneven-aged management techniques or multiple entry clearcut. This is discussed further in Section 3.10.

- *Cedar:* To ensure the presence of cedar stands in the future all mature cedar stands will be managed using techniques that encourage cedar establishment. This is discussed further in Section 3.9.

- *Hemlock:* To ensure the presence of hemlock stands in the future all mature hemlock stands will be managed using techniques that encourage hemlock establishment. This is discussed further in Section 3.11.

WILDLIFE HABITAT

- *Old Spruce/Fir Habitat (OSFH):* Certain wildlife species in New Brunswick require old spruce/fir forest habitat in a specific spatial structure to survive. Specific objectives have been defined for the maintenance of a level of OSFH to ensure this habitat type is preserved. The method for incorporating this in the 2002-management plan is further described in Section 4.0.

- *Deer Wintering Areas (DWA):* White-tailed deer in New Brunswick depend on adequate winter cover to survive. To ensure the presence of this habitat type DWAs have been identified. The method for incorporating these in the 2002- management plan is further described in Section 5.0.

- *Other Habitat Types:* Certain wildlife species in New Brunswick require old hardwood, old tolerant hardwood, old mixedwood, old pine and large mixedwood forest habitat in order to survive. To ensure these habitat types are preserved specific objectives have been defined for the maintenance of their levels. The method for incorporating this in the 2002-management plan is further described in Section 9.0.

WATER

- *Watercourse Buffers:* A buffer of vegetation left on either side of all watercourses, that are 0.5 metres and wider, is required to protect water quality and aquatic habitat. Specific buffer widths and the method for incorporating this requirement in the management plan is further described in Section 6.0.

FOREST ECOSYSTEMS

- *Vegetation Communities:* In an effort to maintain the diversity of plant communities on the License there is a requirement that specified levels of old successional stage vegetation communities, be maintained during the 80-year planning horizon. The result of meeting this objective is discussed in Section 9.0.

- *Unique Sites:* Protection and preservation of unique sites of ecological, historical, cultural, or scenic value is a requirement of Crown land management. The sites identified in this management plan are discussed in Section 8.0.

RECREATION and AESTHETICS

- *Recreation:* Camping, hiking, hunting, fishing and other recreational opportunities on Crown land are all part of the lifestyle enjoyed by the citizens of New Brunswick. The maintenance of these recreational opportunities is discussed in Section 7.0.

1.4 Public Input

The document "A Vision for New Brunswick Forests" was presented to and discussed with the St. Anne-Nackawic stakeholder group. The stakeholder group requested that:

1) the option of leaving a higher percentage of old successional forest be explored.
2) that some protections be built in to ensure that species such as white pine and hemlock are maintained in viable quantities.

Issue 1: Higher percentages of old successional forests.

The impact of preserving more old successional forest was tested and reported to DNRE and the stakeholder group. The results are recorded in table 1.2 (based on aspatial strategy). The numbers in Table 1.2 indicate that old successional stage objective of 12% is surpassed for the spruce, cedar, pine and black spruce vegetation communities. The percentages at the lowest points are 17% for spruce, 39% and 45% for cedar, 27% for pine and 28% for black spruce. The old successional stage objective of 12% is met for the tolerant hardwood and tolerant hardwood-softwood vegetation communities. The lowest levels are in period 1 and 2. The levels increase with time because stands are presently too young to be classed as old successional. In tolerant

hardwood-softwood in ecoregion 7, the exception, the 12% objective is not met until later periods. Actual area in each vegetative community is provided in Appendix 6.

In ecoregion 5, to increase the level of tolerant hardwood-softwood from 12% to 14.5% requires a reduction in annual allowable cut (AAC) of 5%. A 5% reduction in AAC is too much to sacrifice to protect extra older tolerant hardwood-softwood. At the operational level treatments will be explored that could help contribute to the maintenance and enhancement of tolerant hardwood-softwood.

Table 1.2. Minimum level of old successional stage maintained in vegetation communities, and period when minimum level occurs.

Ecoregion	Veg Community	% at Min Level	Period– Min Level
5	Spruce	17.0%	16
	Cedar	39.0%	16
	Pine	27.0%	1
	Pure Tol Hwd	12.5%	1
	Tol Hwd - Swd	12.0%	2
7	Spruce	17.0%	16
	Cedar	45.0%	16
	Black Spruce	28.0%	2 to 7
	Tol Hwd - Swd	09.0%	1

Issue 2: Protecting white pine and Hemlock.

St. Anne will take steps to utilise treatments in existing white pine and hemlock stands that favour the establishment of natural white pine and hemlock. See section 3.10 and 3.11 for further detail.

Public Meetings

There is a requirement that Licensees solicit public views (including those of Sub-Licensees) on how management plan objectives will be met. The issue of public meetings was raised with the St. Anne permanent stakeholder group. The stakeholder group suggested that public meetings be held after the management plan proposal prepared in August 2000. During the fall of 2000 St. Anne-Nackawic Pulp Company Ltd. held a series of public meetings in 5 major communities (Canterbury, Harvey, Nackawic, Stanley and Tracy) within the License 8 area. The meetings were held to inform the public on how crown lands are managed and to get input into how the lands could be better managed to address their concerns. Various issues were discussed, including:

At each meeting the following presentations were made:

1. What is considered in management planning? St. Anne
2. Public input; St. Anne stakeholder group - Member of Stakeholder Group

The following issues were covered in the two presentations:

1. Licensee and DNRE roles, responsibilities and accountability
2. Forest management planning steps
3. Concerns in managing crown
4. Timber sustainability
5. Public values
6. Wildlife habitat objectives
7. Water quality protection
8. Recreation and unique sites
9. Vegetation community objectives
10. Harvest and Silviculture treatments
11. St. Anne permanent stakeholder group
12. Certification

At the meetings the following maps were displayed.

- Map of period 2 (2002-2007) harvest blocks from 1997 management plan
- Map of present DWAs and MCFH
- Map of period 1 (1997-2001) harvest blocks left to cut

People were asked to comment on the location of 2002-2007 harvest blocks. Period 2 (2002-2007) harvest blocks from the 1997 plan will become period 1 harvest blocks in the 2002 plan.

At the meetings the following items were distributed:

- Welcome to St. Anne-Nackawic Pulp Co. Ltd. – Company information
- 8.5 by 11 map of License 8 crown and St. Anne freehold
- 1997 management plan highlights
- N.B. Forests at a Glance produced by N.B.F.P.A.
- A Vision for New Brunswick Forests
- Forestry Facts produced by St. Anne
  - Requirements of licensee in crown management
  - Major values considered in management planning
  - Timber allocation from crown land
  - Description of crown landbase
  - Crown land issues

Although most of the concerns were general in nature, the comments reinforce that the company must be constantly aware that their actions impact on people and the environment. The trade-offs made by the company in the management planning and implementation process have far reaching impacts. Concerns and questions raised at the meetings are summarised in Appendix 7.

1.5 Management Planning Procedures

Incorporating multiple objectives in land management is a challenging process. It requires manipulation of a forest inventory - growing it into the future, while at the same time balancing tradeoffs between objectives. It is a process that is difficult, if not impossible, to handle manually. Consequently, computer-based modelling software has been developed to manipulate data and provide information for decision making. WOODSTOCK wood supply modelling software serves this function for aspatial applications. WOODSTOCK is optimisation-based software that allows determination of optimal levels of an objective function, while meeting defined constraints. The model uses forest inventory data that describes individual stands on the License. Stands with similar growth and development patterns are grouped into strata or classes. Each stratum is described by a timber volume yield curve. A transition matrix describes future development of the stratum after harvesting or silvicultural treatment. Each of these basic components required for planning is discussed in the following Section.

STANLEY is a harvest block-scheduling package that takes you beyond strategic long-term forest management planning to on-the-ground blocked harvest schedules. STANLEY was used to generate a spatial plan from the selected WOODSTOCK aspatial strategy. STANLEY uses assigned rules to group forest classes into harvest blocks and recognises assigned adjacency and size of opening rules in scheduling blocks to periods. STANLEY allows prescheduling. A selected STANLEY spatial strategy can be run through WOODSTOCK to assess the impact of blocking and scheduling on long term sustainability.

2.0 PRESENT LAND BASE DESCRIPTION

2.1 Forest Inventory

This management plan for License 8 is based on a forest inventory developed in 1980-1982, and newer inventory developed in 1994 by interpreting colour aerial photos at a scale of 1:12,500. The interpretation involved delineation of forest stands and assigning attributes (or verifying previously assigned attributes) that described their species composition, maturity and crown closure. These interpreted attributes were supported by a network of 338 temporary sample plots (FDS plots) for 1980-82 inventory and 405 FDS plots for 1994 inventory. These FDS plots supplied additional forest level attributes such as volume, age and height, which increased the number of statistical inferences that could be made about the inventory. In addition, FDS plots from similar conditions on other Licenses were available. The inventory is maintained in a Geographic Information System (GIS) by the Department of Natural Resources and Energy, and harvesting and silviculture is updated annually as these activities take place. Through this procedure the inventory used for this management plan is current to March 31, 1998. In addition to DNRE updates, St. Anne updated the inventory with actual areas harvested and silviculturally treated in 1999 and most of 2000. St. Anne also updated the inventory with actual proposed areas for harvest and silviculture in the remainder of 2000 and all of 2001.

2.1.1 Area Description

License 8 is located in south-western New Brunswick, west of Fredericton (figure 2.1). It is located mainly in York County and comprises a total area of 156,711 ha. As figure 2.2 shows, the majority of this area contains productive forestland (138,925 ha). It is this productive landbase that is the focus of the management plan.

The productive forest area on License 8 can be described in two ways:

(I) Primary Objective: As noted in section 1.3, the 2002 management plan embodies specific land management objectives. As illustrated in figure 2.3, these objectives are applied to specific areas within the productive forest. These specific areas include areas for the management of timber, Old Spruce/Fir Habitat, Deer Winter Habitat (Severe and Moderate), and water quality (buffers). Inaccessible areas include areas where timber harvesting is not currently viable primarily because of steep slopes. Inoperable areas include areas where timber harvesting is not currently viable because of small piece size and low volume. This is generally caused by poor site, the result of poor drainage, bedrock or rock outcrops.

Figure 2.1. Location of Crown Timber License 8 in New Brunswick.

Classification	Area
Productive	138,925
Non-Prod.	2,130
Occupied	1,940
Wetland	13,716
Total	***156,711***

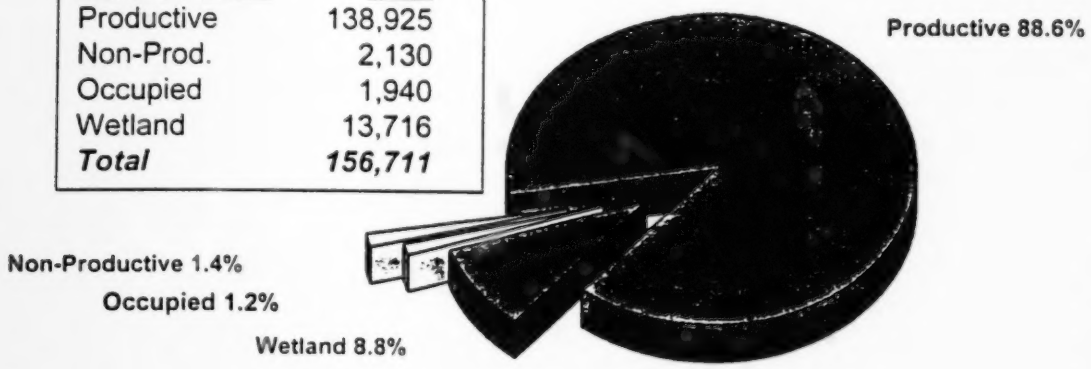

Figure 2.2. Summary of total area by land classification for License 8.

Mgmt. Obj	Area
General	96,326
Gen Buffer	7,061
Gen Inop.	6,609
DWA	19,043
DWA-OSFH	5,463
OSFH	4,423
Total	***138,925***

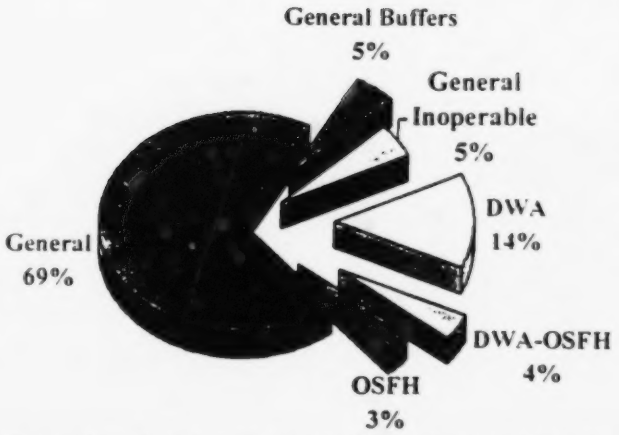

Figure 2.3. Summary of productive forest area by primary objective for License 8.

(II) Broad Cover types: Cover type definition is based on peak volume on timber yield curves, Figure 2.4 illustrates that the productive forest is comprised of ten broad cover types:

- Pine (SW >= 50%; PI >= 35%)
- Jack Pine (SW >= 50%; JP >= 35%)
- Cedar (SW >= 50%; EC >= 35%)
- Black Spruce (SW >= 50%; BS >= 35%)
- Spruce (SW >= 50%; SP >= 35%)
- Balsam Fir ((SW >= 50%; BF >= 35%) or SF)
- Other Softwood (SW >= 50%; EH or TL >= 35%)
- Tolerant Hardwood Pure (SW < 50%; TH >= 20%; TH + RM >= 75%)
- Tolerant Hardwood Dominated (TH >= 20%; TH + RM >= 35% and < 75%)
- Intolerant Hardwood Dominated (SW < 50%; TH < 20% or TH + RM < 35%)

Over time specific stands making up each of these cover types will change as the stands develop. However, one of the objectives over the duration of this management plan is to maintain selected vegetation and habitat communities (cover types) over a minimum area.

Both of these descriptions will be used to develop a multiple-use management plan for License 8.

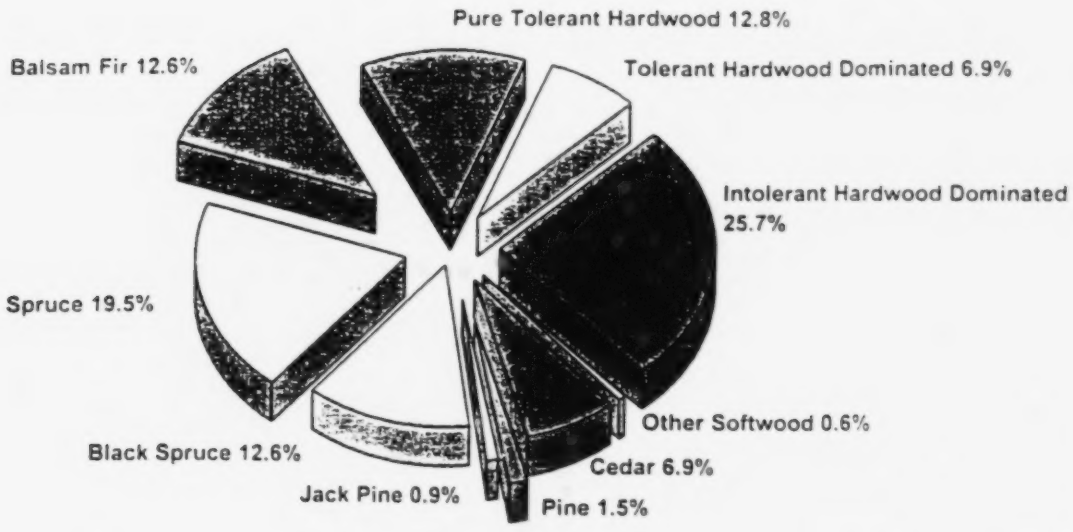

Figure 2.4. Summary of productive forest area by cover types for License 8.

2.1.2 Age Class Distribution

The productive forest on License 8 can also be described on the basis of its age. Figure 2.5 shows the age class structure, by softwood dominated and hardwood dominated cover types, for the productive forest in 20-year age classes. This structure, especially for softwoods, is typical of all New Brunswick forests. It is the result of past management practices and is characterised by an unbalanced age-class structure. Specifically, this forest is dominated by both old and very young stands with fewer stands in the middle age classes. The primary challenge for timber management is to sustain a harvest level that captures the older stands that are declining in operable volume, or growing at reduced rates, before they succumb to natural mortality. This strategy will minimise volume loss by saving younger, healthier stands for future harvest.

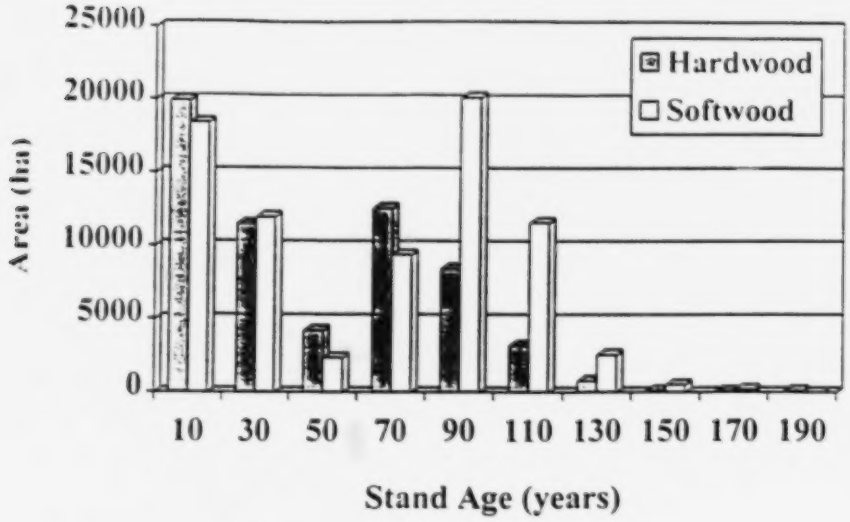

Figure 2.5. Age-class structure for the softwood and hardwood forest on License 8.

2.2 Forest Stratification

As described in Section 1.5, WOODSTOCK wood supply modelling software requires forest stands be grouped into strata or classes having similar development patterns. This requires detailed examination of the inventory for the entire productive forest using all available plot data (forest development survey plots). The plot data is used to decide which stands should be "grouped" together, and which should be "split" apart. It is an iterative process that requires use of stand level growth and yield models as is discussed in the next section. Spatial location (ecoregion and ecodistrict), site, crown closure, maturity, species yield, and species composition were important components in the process. In the final analysis 109 basic strata were developed for the existing mature forest for License 8. Each of these strata is shown in Appendix 2.

2.3 Yield Curves

Each of the strata described in the previous section requires a yield curve that describes its volume development throughout its life span. Yield curves for this management plan were developed using STAMAN3.0 growth and yield modelling software. STAMAN3.0 takes stand descriptions of existing mature stands and forecasts their development through to senescence. The model has been calibrated to New Brunswick forest conditions using provincial permanent sample plot (PSP) data. The summary of yield curves developed, and the procedure for development of each set for each stratum on License 8, is shown in Appendix 2.

2.4 Description of Harvest and Silviculture Treatments

A number of harvest and silviculture treatments, structured for a range of forest types, have been developed. The treatment, treatment description and eligible stand conditions are listed in table 2.1. See Appendix 3 for further detail on treatments and eligible stands.

2.5 Post Treatment Regeneration Response

As forest stands are treated, it is necessary to predict the new stand type that will occur as a result of the treatment. This is done in the WOODSTOCK model through the Transition Matrix. The Transition Matrix for License 8 was developed by stratifying 5th-year plots (surveys that were routinely conducted between 1989 and 1995 on harvested and planted areas). The plots were stratified by pre-cut variables that affect post-cut response and potential for future silvicultural treatments. The 5th-year plots were stratified on ecodistrict and pre-harvest vegetation community. A post-cut vegetation community was determined for each pre-harvest vegetation community at cut block level. Pre-cut stratum with similar post-cut responses were combined.

As shown in Table 2.2, the result was a set of transitions for each of the 9 pre-cut conditions SP11, SP20, SP22, SP28, SW11, SW20, SW22, SW28, TH (all). Each indicates the percent of area that will regenerate to each of the 8 post-harvest conditions. Further information on the Treatment Response Matrix used in WOODSTOCK is given in Appendix 4 of the document "Planners Guide to the 2002 Crown Land Management Plan", prepared by *Forest Management Branch of Department of Natural Resources and Energy*.

Table 2.1. Harvest and silviculture treatments utilised on License 8.

Treatment Code (Action)	Treatment Name	Treatment Description	Stand Type Eligibility
CLEARCUT	Clearcut	Remove all merchantable stems of all species.	All stand types except; those types qualifying for selection cuts in cedar, pine, hemlock, spruce, tolerant hardwood types, and tolerant hardwood-softwood types.
SHELTER-WOOD	Two-Pass Shelterwood	Remove 50 % of total volume concentrating on removing the least stable species such as fir, beech and intolerant hardwood. Second pass conducted after 5-10 years.	Qualifying Spruce and Tolerant Hardwood stands. Used in low quality stands (not eligible for selection cut) to encourage desired regeneration.
	Patch shelterwood	Remove non pine from non pine dominated patches <2 hectares	Qualifying Red Pine stands
STRIPCUT	Strip Cut	Remove 50% of volume by removing alternating strips of predetermined width. Second pass conducted after 10 years.	Qualifying Spruce, Cedar, and Tolerant Hardwood stands. Used in low quality stands (not eligible for selection cut) where clearcut is unacceptable.
SELECTION	Selection (Spruce)	Remove 30-40% of the total volume in the initial pass concentrating on removal of fir, intolerant hardwood, and over mature spruce. Harvesting is by stand prescription based on field data. Remove 50 m^3 of volume every 20 years thereafter.	For application in quality Spruce stands and SP-mix stands with volume greater than 150 m^3/ha.
	Selection (Tolerant Hardwood)	Remove 30-40% of the total volume in the initial pass concentrating on removal of Fir, Intolerant Hardwood, Beech, and Red Maple. Harvesting is by stand prescription based on field data. Remove 50 m^3 of volume every 20 years thereafter.	For application in quality Tolerant Hardwood stands and Tolerant Hardwood-Softwood stands with volume greater than 150 m^3/ha.
	Selection (Cedar)	Remove 30-40% of the total volume concentrating on removal of Fir, Intolerant Hardwoods, Spruce, and over mature Cedar. Remove 50 m^3 of volume every 30 years thereafter.	For application in quality Cedar stands with volume greater than 150 m^3/ha.
	Selection (White Pine)	Remove 40-50% of the total volume concentrating on removal of Fir, Intolerant Hardwoods and Spruce. Remove approx. 75 m^3 of volume every 30 years thereafter.	For application in White Pine stands
	Selection (Hemlock)	Remove 30-40% of the total volume concentrating on removal of Fir, Intolerant Hardwoods, and Spruce. Remove 50 m^3 of volume every 30 years thereafter.	For application in stands with 35% Hemlock or greater.
COMTHIN	Commercial Thinning (Softwood Plantations)	Make three entries; the first at age 30 or 35 removing 40% of the volume, the second at age 50 or 55, removing 40% of the volume, and the third at age 70 or 75, removing 40% of the volume and clearcut at 90 or 95 years.	Softwood Plantations.
	Commercial Thinning (Softwood PCT)	Make one entry at 30 years to remove 40% of the volume. Clearcut at 50 years.	Pre-commercially thinned Spruce-Fir, Spruce, White Birch/Fir, and White Birch.
	Commercial Thinning (Hardwood)	Make three entries; the first at 35 years removing 40% of the volume, the second at 55 years removing 40% of the volume, and the third at 75 years removing 35% of the volume. Recycle or liquidate at 95 years.	Pre-commercially thinned Tolerant Hardwood.
	Commercial Thinning (Tolerant Hardwood/Fir)	Make one entry at 35 years removing 40% of the volume. Clearcut at 55 years or beyond. (Tolerant Hardwood mostly Red Maple with other Intolerant hardwood, White Birch, Poplar, and Ash).	Pre-commercial thinned Tolerant Hardwood/Fir
	Commercial Thinning (Red Pine)	Make three entries; the first at 50 years removing 40% of the volume, the second at 70 years removing 40% of the volume, and the third at 90 years removing 35% of the volume. Clearcut at 110 years and replant to Pine.	Red Pine Plantations.
PLANT_BS PLANT_RS PLANT_WS PLANT_JP PLANT_RP PLANT_WP	Full Planting	Artificial regeneration of harvest blocks with a suitable species (Black Spruce, Red Spruce, White Spruce, Jack Pine, Red Pine, and White Pine) at 2000 – 2500 stems/ha.	All harvested blocks with softwood stocking less than 30%. Exception: areas regenerating to desirable Tolerant Hardwoods and/or Birch.
FILL_PLANT	Fill Planting	Artificial regeneration of harvest blocks where stocking is increased to 90%+ with suitable species, allowing for natural regeneration.	All harvested blocks with softwood stocking between 30% and 60%. Exception: areas regenerating to desirable Tolerant Hardwoods and/or Birch.
SPACE_SW SPACE_MW SPACE_HW	Spacing	Density reduction on harvest blocks with good stocking of commercial species and high densities.	All harvest blocks with high-density regeneration except pure Intolerant Hardwood (Aspen).

Table 2.2. Transition Matrix for License 8 for various pre-cut cover types.

PRECUT	% of POSTCUT COMMUNITY							
	BF1	BF2	HW3	HW4	TS4	EC1	FIL	PLN
SP 11	29	28	29	0	0	0	0	14
SP 20	12	7	38	9	2	12	7	13
SP 22	6	14	57	6	2	0	0	15
SP 28	23	19	36	9	0	0	0	13
SW 11	12	20	36	8	5	0	5	14
SW 20	8	18	40	8	4	4	4	14
SW 22	5	19	50	12	0	0	0	14
SW 28	9	10	41	17	4	0	4	15
TH ALL	0	6	46	9	24	0	0	15

Grouping of Vegetation Communities for Matrix Rows

SP -BS, SP, PI
SW -BF, EC, SF, OS, HW, TS
TH -PT

Stocking Classes

BF1 - Space SW
BF2 - Space SW, MW
HW3 - Space SW, MW, HW
HW4 - Space HW, Fill Plant
TS4 - Space HW
EC1 - Natural cedar
FIL - Fill Plant
PLN - Full Plant

Groupings of Ecodistricts for Matrix Rows

11 -11
20 -20, 27
22 -22, 23, 25, 33
28 -28

Grouping of transitions

BF1 - BF1, PF1, BS1, PIN
BF2 - BF2, PF2, SP2
HW3 - BF3, PF3, PS3, HW3
HW4 - HW4
TS4 - TS4
EC1 - EC1
FIL - FIL
PLN - PLN

3.0 GENERAL FOREST

The general forest comprises 109,996 ha and is that portion of the productive forest (including buffers) on License 8 that is not subject to specific non-timber objectives, such as Old Spruce Fir Habitat (OSFH) and Deer Wintering Area (DWA). The general forest however, is expected to maintain a gross level of OSFH from period 8 to the end of the planning horizon. In addition, habitat for the whole planning horizon is provided from the general forest for all species that are not specifically linked to the Severe Winter Deer Habitat (SWDH), Moderate Winter Deer Habitat (MWDH) and OSFH objectives. The general forest is managed for timber production within the guidelines laid out in the Forest Management Manual.

3.1 Objectives

The OSFH and DWA landbases were modelled separately because of their different habitat objectives. The selected OSFH and DWA strategies were prescheduled and the whole landbase, general forest along with OSFH and DWA landbases, were modelled as one unit. The objective was to maximise total volume with even flow softwood and hardwood over an 80 year planning horizon for the whole landbase. Softwood and hardwood harvest levels were increased in the future where possible only after all other objectives were met. A number of harvest treatments were allowed in an attempt to reflect treatments being applied operationally. Silviculture (both planting and spacing) was factored in at appropriate levels to enhance the harvest level, while not compromising aspatial OSFH, and other vegetation and habitat community levels. In order to improve piece size, quality, species composition in the future, and to provide short-term fibre production, commercial thinning was applied.

3.2 Silviculture impacts on Annual Allowable Cut (AAC)

Immediate AAC: The impact of planting and spacing was tested in the general forest. The various combinations of planting and spacing levels were set in a *maximise total volume* strategy, with even flow softwood and hardwood. All harvest treatments including commercial thinning were allowed at levels determined by the model. Planting was all softwood while spacing could be softwood, mixedwood or hardwood. The model picked the type of planting and spacing which would best contribute to the optimal total harvest level. Silviculture (planting and spacing) has a positive impact on sustainable harvest levels. If planting and spacing is not conducted on License 8 the aspatial sustainable harvest level is 94,000 m^3/yr of softwood and 99,500 m^3/yr of hardwood as shown in Table 3.1 and Table 3.2 respectively. The planting done now is still giving AAC advantage because these areas are available for commercial thinning in the next thirty years. Without commercial thinning combined with planting there would be no AAC advantage. In this scenario, at the planting level of 300 ha/yr and spacing level of 800 ha/yr the aspatial sustainable harvest level is 141,900 m^3/yr of softwood and 149,900 m^3/yr of hardwood. Immediate Softwood and Hardwood AAC is increased

by 51% and 50.7%, respectively. In Table 3.2, note the negative effect softwood planting levels of 200 ha/yr have on hardwood AAC, especially at lower spacing levels. There is however, a steady increase in total AAC (softwood and hardwood) with increased silviculture levels. The increase in AAC is evident up to 800 ha/yr of spacing and 300 ha/yr of planting. This scenario demonstrates the significant impact of planting and spacing on AAC.

Table 3.1. Immediate increase in softwood AAC (aspatial) that is possible using various silviculture levels (annual) on License 8.

PLANT*	SPACING**									
	0	100	200	300	400	500	600	700	800	900
0	94,000	103,300	108,200	114,500	120,500	124,800	128,300	131,700	134,700	Infeasible
100	102,700	109,000	113,700	119,300	124,300	128,600	132,300	135,500	137,200	
200	110,100	115,200	120,000	125,500	129,900	133,400	136,900	139,900	141,000	
300	113,400	119,600	123,900	129,900	133,000	137,800	139,300	141,100	141,900	
400	Infeasible									

* Planting is all Softwood.

** Spacing includes softwood, mixedwood and hardwood.

Table 3.2. Immediate increase in hardwood AAC (aspatial) that is possible using various silviculture levels (annual) on License 8.

PLANT*	SPACING**									
	0	100	200	300	400	500	600	700	800	900
0	99,500	104,700	112,400	118,100	123,200	129,500	135,500	140,900	146,300	Infeasible
100	99,800	106,600	114,300	120,300	126,100	131,800	137,300	142,700	149,100	
200	98,000	105,900	113,300	119,100	125,500	131,700	137,200	142,600	149,000	
300	98,400	105,500	113,500	118,800	126,100	130,600	137,700	143,700	149,900	
400	Infeasible									

* Planting is all Softwood.

** Spacing includes softwood, mixed wood and hardwood.

3.3 Sustainable Harvest Levels (General Forest)

3.3.1 Blocking Strategy

Blocking strategy can be divided into three main steps:

- prescheduling
- STANLEY blocking
- manual editing

Blocking consisted of prescheduling period two harvest blocks from 1997 management plan to period 1 of 2002 management plan. The remaining area for period 1 and

subsequent periods was selected using STANLEY (see section 1.5 in management planning procedures). STANLEY is capable of grouping individual stands into viable harvest blocks and scheduling those blocks to meet green-up. The final step involved manual editing. Blocking results in a reduction in sustainable wood supply.

Prescheduling Period One

Since the blocks were already approved by DNRE, period two blocks from the 1997 Management Plan are the best starting point for period one blocks for the 2002 blocked tactical plan. Before the blocks were prescheduled they were observed. If necessary they were modified based on office, ground or aerial observation. In the office, approximately 1420 hectares (thirty-one blocks) of period two blocks were built into the harvest update (as already cut) for period 1997-2001. These blocks were rescheduled to 1997-2001 to account for area removed from 1997-2001 harvest blocks because of immaturity, adjacency, wildlife concerns, inoperable and unmapped streams etc. In the office the remainder of the period two blocks from the 1997-2001 plan, were checked for surrounding stands or groups of stands that could be added to, or deleted from, the block. During the aerial survey these additions and deletions were checked for compatibility with the block and period. During the aerial survey the following decisions were made:

- Schedule to period one (no reason not to cut in period one (2002-2007))
- Rescheduled to a future period
- Schedule to period one (add area)
- Schedule to period one (remove area)

From aerial observation eighty-seven (87) blocks (approximately 3706 hectares) were scheduled to period one with no modifications, twenty-three (23) blocks (465 hectares) were scheduled to period one with modifications, twenty-five (25) blocks (482 hectares) were rescheduled to later periods.

Ground cruise was conducted on fifty-eight blocks amounting to approximately 2800 ha. The ground and aerial observations were used to modify blocks for prescheduling. Approximately eighty-three hundred (8300) hectares were prescheduled.

STANLEY was utilized to select the remaining area necessary for harvest in period one.

Green up

Green up is a concern with clearcuts, two-pass shelterwood, and strip cuts. A two period delay relates to an expected height growth of two meters that reflects a structural difference between regenerating cuts that are significant to wildlife. A two period green up was modelled.

Adjacency and Proximity

Adjacency connotes connectivity. Adjacent distance is the maximum distance allowed in STANLEY when combining stands into blocks. Adjacent distance was set at thirty (30) meters.

Proximity connotes nearness. Proximate blocks cannot be scheduled for harvest within the green up delay. Proximal distance was set at fifty (50) meters.

Maximum and Minimum Opening Size

A maximum opening size of one hundred (100) hectares and a minimum opening size of five (5) hectares was utilised. Several clearcut blocks can be grouped as long as the total opening size is not greater than one hundred (100) hectares. The operability of blocks with minimum opening size depends on location and wood quality. STANLEY can't handle location and wood quality. There has to be a trade off between leaving too much area too small to block, and making small blocks that are difficult to operate. Some manual editing was necessary to ensure that small blocks were operable.

Schedule Editing

STANLEY produces a blocked tactical plan. The blocked plan was manually edited to:

- Remove slivers
- Modify irregular block shapes by removing full stands
- Remove or reschedule blocks (small, isolated or other operational constraints)
- Modify blocks for green up
- Modify block size
- Modify harvest periods re: treatment windows

Over size blocks and green up

Due to the number of alternate harvest treatment and the difficulty in mapping the exact location of these treatments at management plan level, many of the proposed locations for these treatments will change at the operational level. Some blocks were not modified if it was felt that alternate non-clearcut treatments would be utilised in the block. Shapes and locations of these blocks at operational level will be changed to accommodate treatments. Since all alternate harvest treatments (selection, strip, two pass shelterwood, patch shelterwood and commercial thin) are linked directly to specific stand structure, many blocks will be treated different than proposed in the management plan. Maintaining treatment levels proposed in the plan are what is important.

3.3.2 Sustainable Harvest Levels (Spatial)

Table 3.3 summarises the spatial periodic harvest levels for period one to period five. The harvest from the general forest is not constant over the first five periods. The softwood harvest from the general forest has to increase in period three to four to compensate for reduced harvest in DWA and OSFH. The hardwood harvest from the

general forest has to increase in period three to five to compensate for reduced harvest in DWA and OSFH. Some manual adjustments were made to handle edits that could not be handled in the model. Volume adjustment factors are provided in Appendix 10.

Table 3.3. Summary of Spatial Harvest Levels (m^3/period) in the General Forest on License 8.

PERIOD	SPRUCE FIR&JACK PINE	HARDWOOD	CEDAR	PINE	HEMLOCK	LARCH
1	645,800	670,800	78,600	28,600	26,000	7,800
2	649,500	657,400	72,600	24,500	24,800	8,800
3	713,600	722,700	76,800	28,900	25,900	13,200
4	709,800	721,000	63,800	16,800	20,600	5,900
5	783,900	726,200	56,800	22,300	20,600	3,900

3.4 Summary of Harvest Treatments (General Forest)

Some changes were made subsequent to modelling completion. Area adjustment factors pertaining to tables 3.4 to 3.8 are provided in Appendix 10.

Proposed levels of commercial thinning for five periods are listed in Table 3.4. Commercial thinning will start in period 1 with 1,170 ha in mainly softwood and hardwood spacings. There is no significant commercial thinning in softwood plantations until period three.

Table 3.4. Summary of Spatial Commercial Thinning Levels (ha/period) in the General Forest on License 8.

Period	In Softwood Plantation	In Softwood Spacing	In Hardwood Spacing
1	0	560	610
2	50	860	915
3	1,080	1,435	1,205
4	1,700	560	540
5	2,365	60	25

Estimates for levels of treatment (selection, strip and two-pass shelterwood) by stratum were produced by St. Anne and DNRE field staff. The actual levels in the plan were based on these estimates of availability for harvest treatments. Availability estimates by stratum are included in Appendix 3.

Proposed levels of selection cut are listed in Table 3.5. Selection cut will be carried out in five forest strata. They include Spruce/Fir, Tolerant Hardwood, Cedar, Pine and Hemlock.

Table 3.5. Summary of Spatial Selection Cut Levels (ha/period) in the General Forest on License 8.

Period	Spruce/Fir	Tolerant Hardwood	Cedar	Pine	Hemlock
1	230	1,275	100	85	15
2	235	1,795	105	70	35
3	315	1,455	285	120	35
4	120	1,670	225	85	30
5	65	875	205	45	85

Proposed levels of strip cut are listed in Table 3.6. Strip cut will be carried out in three forest strata. They include Spruce/Fir, Tolerant Hardwood and Cedar.

Table 3.6. Summary of Spatial Strip Cut Levels (ha/period) in the General Forest on License 8.

Period	Spruce/Fir	Tolerant Hardwood	Cedar
1	260	85	90
2	180	90	145
3	90	245	250
4	125	185	70
5	160	130	70

Proposed levels of two-pass shelterwood are listed in Table 3.7. Two-pass shelterwood will be carried out in two forest strata. These include Spruce/Fir and Tolerant Hardwood.

Table 3.7. Summary of Spatial Two-Pass Shelterwood Levels (ha/period) in the General Forest on License 8.

Period	Spruce/Fir	Tolerant Hardwood
1	0	200
2	155	550
3	60	215
4	10	300
5	45	150

Proposed levels of clearcut are listed in Table 3.8. Clearcut will be carried out in the majority of forest strata.

Table 3.8. Summary of Spatial Clearcut Levels (ha/period) in the General Forest on License 8.

Period	Clearcut Area (ha/period)
1	8,416
2	7,564
3	7,757
4	7,771
5	8,225

The block size varies from five (5) hectares to one hundred and forty four (144) hectares in period 1. The average block size for the first five periods is provided in table 3.9. A block summary including block area and volume is provided in Appendix 11.

Table 3.9. Average Harvest Block Opening Size in General Forest on License 8.

HAVEST PERIOD	AVERAGE BLOCK SIZE (HA)
1	29
2	26
3	29
4	27
5	30

3.5 Summary of Silviculture Treatments (General Forest)

Proposed levels of planting and spacing, for the first five periods, are listed in Table 3.10. The annual level (based on a 5 period average) in the general forest for period one of planting is 305 ha. and of spacing is 1,285 ha.

Estimates for levels of treatment (selection, strip and two-pass shelterwood) by stratum were produced by St. Anne and DNRE field staff. The actual levels in the plan were based on these estimates of availability for harvest treatments. Availability estimates by stratum are included in Appendix 3.

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3	60	215
4	10	300
5	45	150

Proposed levels of clearcut are listed in Table 3.8. Clearcut will be carried out in the majority of forest strata.

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Table 3.10. Summary of Silviculture Levels (ha/period) in General Forest on License 8.

Period	Planting		Spacing		
	Full	Fill	Softwood	Mixedwood	Hardwood
1	1,025	560	615	3,490	1,440
2	1,135	175	635	3,645	1,585
3	1,575	100	690	4,065	1,665
4	1,300	165	705	4,310	1,980
5	1,400	175	755	4,515	1,975

3.6 Operable Growing Stock

Operable growing stock is the total amount of volume available in the general forest for any harvest action at any point in time. It is the accumulation of curve volume multiplied by stratum area, at the age of the stratum, providing the age of the stratum is between the minimum and maximum operable age.

3.6.1 Hardwood Growing Stock

Hardwood growing stock peaks in period 1 at 2,978,300 m^3/period, declining with harvest until it reaches a low of 1,036,200 m^3/period in period 15 (Figure 3.1). At the end of the planning horizon the growing stock is greater (43% more) than the aspatial period harvest level of 814,500 m^3/period at that point.

Long-term Hardwood AAC: Spacing is the only silviculture treatment for hardwood. The benefits of spacing are realised twenty (20) to twenty-five (25) years after treatment. Spacing, by shortening rotation, allows short-term increases in annual allowable cut. In order to sustain the short-term increases in AAC into the future, spacing has to be continued. Spacing does not allow for significant expansion of AAC in the future. The periodic harvest can increase from 759,200 m^3 (spatial) in period five to 814,500 m^3 (aspatial) in period six. Along with the maintenance of AAC comes improved piece size and improved species mix. See Appendix 10 for periodic harvest level values.

Table 3.10. Summary of Silviculture Levels (ha/period) in General Forest on License 8.

Period	Planting		Spacing		
	Full	Fill	Softwood	Mixedwood	Hardwood
1	1,025	560	615	3,490	1,440
2	1,135	175	635	3,645	1,585
3	1,575	100	690	4,065	1,665
4	1,300	165	705	4,310	1,980
5	1,400	175	755	4,515	1,975

3.6 Operable Growing Stock

Operable growing stock is the total amount of volume available in the general forest for any harvest action at any point in time. It is the accumulation of curve volume multiplied by stratum area, at the age of the stratum, providing the age of the stratum is between the minimum and maximum operable age.

3.6.1 Hardwood Growing Stock

Hardwood growing stock peaks in period 1 at 2,978,300 m^3/period, declining with harvest until it reaches a low of 1,036,200 m^3/period in period 15 (Figure 3.1). At the end of the planning horizon the growing stock is greater (43% more) than the aspatial period harvest level of 814,500 m^3/period at that point.

Long-term Hardwood AAC: Spacing is the only silviculture treatment for hardwood. The benefits of spacing are realised twenty (20) to twenty-five (25) years after treatment. Spacing, by shortening rotation, allows short-term increases in annual allowable cut. In order to sustain the short-term increases in AAC into the future, spacing has to be continued. Spacing does not allow for significant expansion of AAC in the future. The periodic harvest can increase from 759,200 m^3 (spatial) in period five to 814,500 m^3 (aspatial) in period six. Along with the maintenance of AAC comes improved piece size and improved species mix. See Appendix 10 for periodic harvest level values.

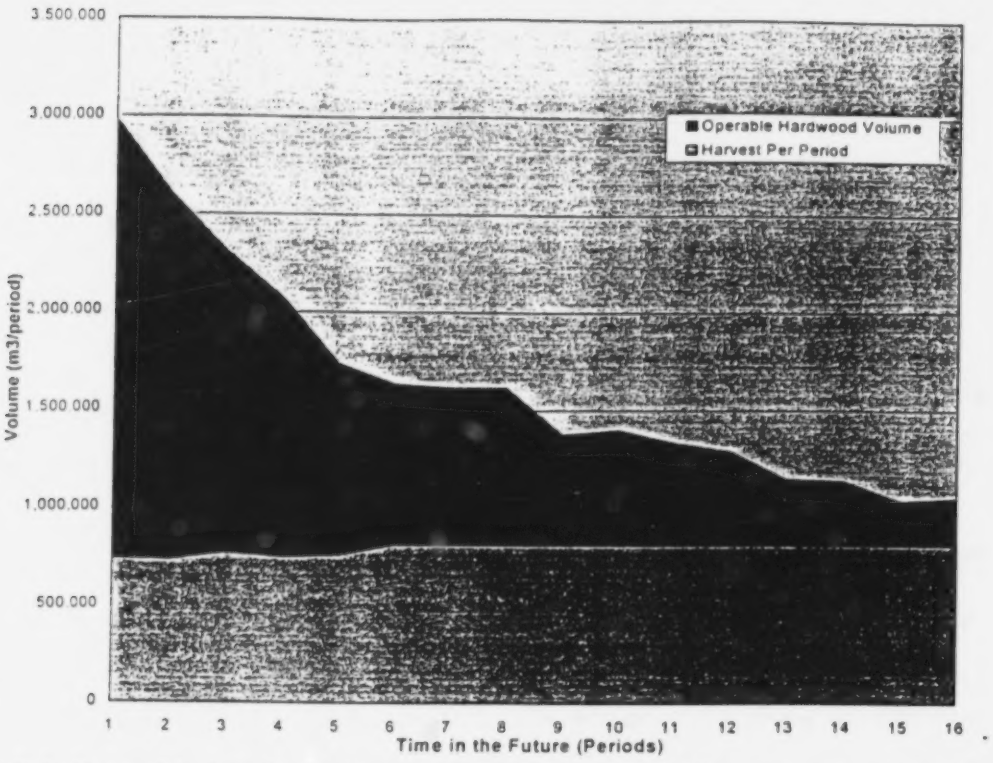

Figure 3.1. Operable hardwood growing stock (general forest) and spatial harvest level (total forest) over 80 years for License 8.

3.6.2 Softwood Growing Stock

Softwood growing stock peaks in period one at 2,752,200 m^3/period, declining with harvest until it reaches a plateau of 1,771,500 m^3/period in period four (figure 3.2). The growing stock stays relatively constant between periods four to thirteen, then decreases to the minimum of 1,542,200 m^3/period in period fifteen. This stable growing stock between period four to thirteen is accomplished along with an increase in periodic harvest level.

Long-term Softwood AAC: Silviculture levels have the effect of increasing future Spruce, Fir and Jack Pine growing stock and therefore future AAC. Figure 3.2 shows the impact of silviculture treatment on growing stock. Present silviculture treatments have significant impact on growing stock, which will translate into increased softwood AAC at some point in the future. The periodic harvest can increase from 754,600 m^3 (spatial) in period four to 845,500 m^3 (spatial) in period five, 941,000 m^3 (aspatial) in period six, 1,094,900 m^3 (aspatial) in period seven, 1,156,700 m^3 (aspatial) in period

thirteen, and to 1,211,400 m^3 (aspatial) in period sixteen. See Appendix 10 for periodic harvest level values.

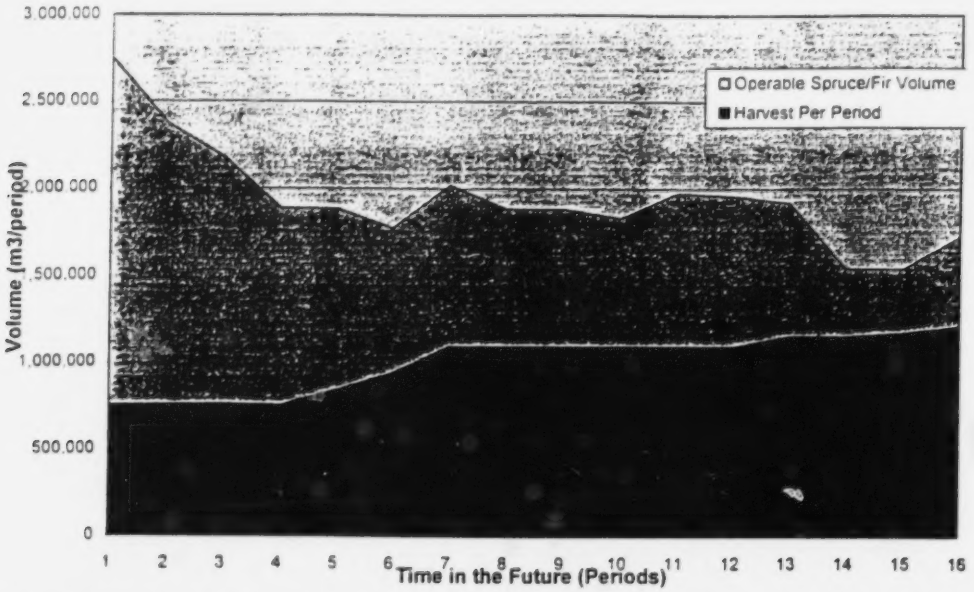

Figure 3.2. Operable softwood growing stock (general forest) and spatial harvest level (total forest) over 80 years for License 8.

3.7 Softwood Dominated Strata

3.7.1 Objectives

To maintain softwood vegetation and habitat communities at or above levels set in the DNRE Vision Statement "A Vision for New Brunswick Forests ... Goals and Objectives for Crown Land Management"

3.7.2 Harvest Prescriptions

Softwood dominated stratum vary in stand structure, species composition, volume and site. These differences result in differing potential for harvest treatment. Some strata have only potential for clearcut, while other strata have potential for clearcut, selection cut, two-pass shelterwood or strip cut. From photo interpreted attributes, it is impossible to form stratum with potential only for selection, two-pass shelterwood or strip cut. The exact location of treatments in the field will have to be determined from pre-harvest assessment. The percentage of each stratum available for alternate harvest treatments was estimated by DNRE and St. Anne field staff based on field experience and professional judgement. The estimates of availability for harvest treatments by stratum are included in Appendix 3.

Potential for Clearcut:

- BF, PF and Fir stratum (Fir stratum with high Balsam Fir content)
- SF stratum (Spruce-Fir stratum but low spruce content)
- BS stratum (Black Spruce stratum normally grows on poor, shallow, unstable soils with high chance of windthrow)

The actual stratum, with only potential for even-aged management, are listed in Appendix 3.

Potential for Clearcut, Selection Cut, Two-Pass Shelterwood and Strip Cut:

- SP and PS stratum (Spruce strata)
- BF, PF and FIR stratum (Fir stratum with higher spruce contents)

The selection cut treatment will be utilised in stable stands with at least 150 m^3 /ha of volume. Stands must be growing on stable, moist to dry sites with potential to produce high value spruce timber and/or desired wildlife habitat indefinitely. The first entry, and to a lesser extent subsequent entries, salvage imminent mortality, improve stand quality, and encourage the establishment and growth of younger quality stems. Re-entry is on a 20-year cycle with a volume removal of 50m^3/ha. Treatment windows are included in Appendix 3.

The two-pass shelterwood treatment is utilised in stands that do not have the stand quality and potential for selection cut but are growing on stable, moist to dry sites where windthrow is not a concern. The two-pass shelterwood treatment is utilised to salvage imminent mortality while creating an environment that encourages the establishment of high quality natural regeneration (red spruce). In the first entry 50% of the stand volume is removed. In the second entry, the residual stand cover is removed. The second entry is conducted after desired natural regeneration is established, usually 5 to 10 years after first entry. If the first entry is to only salvage imminent mortality, growth and stability of the residual stand may govern the timing of the second entry.

The strip cut treatment is utilised in stands that do not have the stand quality and potential for selection cut but are growing on stable, moist to dry sites where windthrow is not a concern. The strip cut treatment is utilised to encourage the establishment of high quality natural regeneration (red spruce), and/or lessen the visual impact of clearcut or lessen the impact on the environment of one large clearcut. In the first entry 50% of the stand volume is removed by removing 100% of the volume from alternating predetermined strip widths. In the second entry, the residual strips are removed. The second entry is conducted after the desired natural regeneration is established, usually 10 to 15 years after the first entry.

Planting (full or fill) is conducted in clearcut areas on softwood sites that do not regenerate naturally to softwood species.

Pre-commercial thinning (SW, MW) is utilised to reduce stem densities in naturally regenerated cutovers. Naturally regenerated cutovers can be manipulated toward either softwood or hardwood because many cutovers regenerate to both softwood and hardwood. Species selection in pre-commercial thinning must be a combination of the best trees for the site and meeting the long-term objectives for timber and non-timber values.

Commercial thinning is a necessary option in the future to:

(1) ensure maximum quality potential from plantations and spaced areas
(2) make fibre available at an earlier date.

It is recognised that early commercial thinning will be expensive but the future benefits can make it worthwhile. The estimates for yield from first entry commercial thinning are conservative, varying from 30 m^3/ha to 50 m^3/ha, so as not to over state potential.

- Plantations are available for commercial thinning at age 30 or 35 with two re-entries at 20-year intervals, and liquidation at age 90 or 95.
- Pre-commercially thinned Spruce, Spruce-Fir and Spruce-mixed conditions are available for one entry at age 30 and liquidation at age 50.

By modelling the whole forest as one unit, an acceptable harvest and silviculture strategy was developed, which maintains Softwood dominated stratum.

3.8 Hardwood Dominated Strata

3.8.1 Objectives

To maintain hardwood vegetation and habitat communities at or above levels set in the DNRE Vision Statement "A Vision for New Brunswick Forests ... Goals and Objectives for Crown Land Management"

3.8.2 Harvest Prescriptions

Hardwood dominated stratum include stands where, over the life of the stand, tolerant and intolerant hardwood species dominate. They dominate either in pure conditions or in mixes. They also include stands where tolerant and intolerant hardwood dominate in mixes with lesser amounts of softwood. Hardwood dominated stratum vary in stand structure, species composition, volume, and site. This variance results in differing potential for harvest treatment. Some stratum only have potential for clearcut while other stratum have potential for clearcut along with potential for selection cut, two-pass shelterwood or strip cut.

3.8.2.1 Intolerant Hardwood Dominated Strata

The intolerant hardwood and intolerant hardwood/softwood stratum are only available for even-aged management (clearcut). The following hardwood stratum are predominately available for clearcut.

- HW stratum (high intolerant hardwood and fir content)

The actual strata with only potential for even-aged management are listed in Appendix 3.

3.8.2.2 Tolerant Hardwood Dominated Strata

The Department of Natural Resources and Energy requires that tolerant hardwood stands with potential for sawlogs and veneer production be managed using selection harvest techniques. Not all stands have potential for selection cut. Stands that are not potential quality for selection cut are available for clearcut, two-pass shelterwood or strip cut. From photo interpreted attributes, it is impossible to form strata with potential for only selection, only two-pass shelterwood, or only strip cut. The exact location of treatments in the field will have to be determined from pre-harvest assessment. The percentage of each stratum available for alternate harvest treatments was estimated by DNRE and St. Anne field staff based on field experience and professional judgement. The estimates of availability for harvest treatments by stratum, and modelling objectives for tolerant hardwood dominated groupings are included in Appendix 3.

Clearcut is utilised in some tolerant hardwood strata. Some tolerant hardwood strata are only available for clearcut.

- TS strata (Tolerant hardwood mixes with high red maple and/or fir content)

The actual strata with only potential for even-aged management are listed in Appendix 3.

The remaining strata are available for clearcut, selection cut, two-pass shelterwood or strip cut depending on the stand structure, species composition and site potential.

- PT strata (pure tolerant hardwood stratum)
- TS strata (tolerant hardwood mixes with high sugar maple, yellow birch, spruce content)

The selection cut treatment will be utilised in mature stands with at least 150 m^3/ha of volume. Stands must be growing on good sites with potential to produce high value hardwood sawlogs and veneer, and/or desired vegetation and habitat communities, indefinitely. The first entry, and mainly subsequent entries, salvage imminent mortality, improve stand quality, and encourage the establishment and growth of younger quality stems. Re-entry is on a 20-year cycle with volume removal of 50m^3. Treatment windows are included in Appendix 3.

The two-pass shelterwood treatment is utilised in stands that do not have the stand quality and potential for selection cut but are growing on good sites where windthrow is not a concern. The two-pass shelterwood treatment is utilised to salvage imminent mortality and/or to encourage the establishment of high quality natural regeneration (sugar maple and red spruce). In the first entry 50% of the stand volume is removed. In the second entry, the residual stand cover is removed. The second entry is conducted after desired natural regeneration is established, usually 5 to 10 years after first entry. If the first entry is only to salvage imminent mortality then growth and stability of the residual stand could govern the timing of the second entry.

The strip cut treatment is utilised in stands that do not have the stand quality and potential for selection cut, but are growing on good sites where windthrow is not a concern. The strip cut treatment is utilised to encourage the establishment of high quality natural regeneration (sugar maple and red spruce). The strip cut treatment may also be used to lessen the visual impact of clearcutting, or lessen the impact on the environment of one large clearcut. In the first entry 50% of the total stand volume is removed by removing 100% of the volume from alternating predetermined strip widths. In the second entry, the residual strips are removed. The second entry is conducted after desired natural regeneration is established usually 10 to 15 years after first entry.

Planting is not utilised to regenerate hardwood.

Pre-commercial thinning (HW, MW) is utilised to reduce stem densities in naturally regenerated cutovers. Naturally regenerated cutovers can be manipulated toward either hardwood or softwood because many cutovers will regenerate to both hardwood and softwood. Species selection in pre-commercial thinning must be a combination of the best trees for the site, and meeting the long-term objectives for timber and non-timber objectives.

Commercial thinning is a very necessary option in the future to:

(1) ensure maximum quality potential from spaced areas, and
(2) to make fibre available at an earlier date.

It is recognised that early commercial thinning will be expensive but the future benefits can make it worthwhile. The estimates for yield from early thinning are conservative varying from 30 m^3/ha to 50 m^3/ha, so as not to over state potential.

- Pre-commercially thinned tolerant hardwood and tolerant hardwood-Fir conditions are available for first entry at age 35 with 2 re-entries at 20-year intervals and recycling indefinitely at age 95.
- Pre-commercially thinned intolerant hardwood (White Birch) and intolerant hardwood-fir (white birch-fir) conditions are available for first entry at age 30 and liquidation at age 50.

By modelling the whole forest as one unit, an acceptable harvest and silviculture strategy was developed which maintains hardwood-dominated stratum.

3.9 Cedar Dominated Strata

3.9.1 Objectives

To maintain Cedar vegetation and habitat communities at or above levels set in the DNRE Vision Statement "A Vision for New Brunswick Forests ... Goals and Objectives for Crown Land Management"

3.9.2 Harvest Prescriptions

Due to the inability of cedar to regenerate post-clearcut, alternate harvest treatments will be used where possible to ensure the viability of the future Cedar forest community.

Cedar dominated strata vary in stand structure, species composition, volume and site. This variance results in differing potential for harvest treatment. All Cedar strata have potential for clearcut along with potential for selection cut or strip cut (exception: In DWAs cedar is not clearcut). From photo interpreted attributes it is impossible to form strata with potential for only selection cut or strip cut. The exact location of treatments in the field will have to be determined from pre-harvest assessment. The percentage of each stratum available for alternate harvest treatments was estimated by DNRE and St. Anne field staff based on field experience and professional judgement. The estimates of availability for harvest treatments by stratum are included in Appendix 3.
The selection cut treatment will be utilised in young to mature stands with at least 150m^3 /ha of volume. Stands to be eligible must be growing on stable, moist to dry sites with potential to produce high quality cedar and/or desired wildlife habitat, indefinitely. The first entry and to a lesser extent subsequent entries are to salvage imminent mortality, improve stand quality and encourage the establishment and growth of younger quality cedar stems. Re-entry is on a 30-year cycle after the first entry with a volume removal of 50 m^3. Treatment windows are included in Appendix 3.

The strip cut treatment is utilised in stands that do not have the stand quality and potential for selection cut, but are growing on stable, moist to dry sites where windthrow is not a concern. The strip cut treatment is utilised to encourage the establishment of natural regeneration (cedar). In the first entry 50% of the total stand volume is removed by removing 100% of the volume from alternating predetermined strip widths. In the second entry, the residual strips are removed. The second entry is conducted after desired natural regeneration is established, usually 10 to 15 years after first entry.

Clearcutting is utilised in stands with no potential to produce a future cedar stratum and in stands too unstable to use selection or strip cut.

Planting and pre-commercial thinning are not options utilised to produce future cedar strata. Sufficient cedar can be maintained through selection cut and strip cut.

By modelling the whole forest as one unit, an acceptable harvest and silviculture strategy was developed for maintaining cedar-dominated strata.

3.10 Pine Dominated Strata

3.10.1 Objectives

To maintain Pine vegetation and habitat communities at or above levels set in the DNRE Vision Statement "A Vision for New Brunswick Forests ... Goals and Objectives for Crown Land Management"

3.10.2 Harvest Prescriptions

Due to the inability of pine to regenerate post-clearcut, alternate harvest treatments will be used where possible to ensure the viability of the future Pine forest community. Pine dominated stratum are variable in stand structure, species composition, and volume, however, they were all allocated for selection cut or patch shelterwood. From photo interpreted attributes, it is impossible to form strata with potential for only selection cut, or for only patch shelterwood. The exact location and level of treatments in the field will have to be determined from pre-harvest assessment.

3.10.2.1 White Pine

White pine must be regenerated under some cover to prevent or lessen damage from the white pine weevil. The selection cut treatment will be utilised in young to over mature stands of varying volume per hectare. All stands will be managed to encourage the establishment of white pine natural regeneration and/or to produce desired vegetation and wildlife habitat communities, indefinitely. The first entry, and to a lesser extent subsequent entries, salvage imminent mortality, improve stand quality, and encourage the establishment and growth of younger quality white pine stems. Re-entry is on a 30-year cycle with a volume removal of approximately 75m^3/ha. Treatment windows are included in Appendix 3.

Planting of white pine on selected sites will be utilised to help ensure the future viability of the PINE stratum.

3.10.2.2 Red Pine

Red Pine is handled under patch shelterwood cutting. The assumption is made that stands will be entered up to three times on a twenty-year cycle.

Planting of red pine on selected sites will be utilised to help ensure the future viability of the PINE stratum.

Commercial thinning is utilised in red pine plantations with the first entry at age 50, two re-entries at 20-year intervals and liquidation at age 110. The first entry was set at age 50 for several reasons:

(1) Higher density during sapling stage should encourage straight, clean stems, which will be valued in future.
(2) Due to its intolerance, red pine should naturally thin itself.
(3) Low demand or inconsistent demand for red pine pulp.

Pre-commercial thinning to produce Pine strata is not an option, but where possible in pre-commercial thins quality red and white pine will be favoured.

By modelling the whole General Forest as one unit, an acceptable harvest and silviculture strategy was developed for maintaining pine-dominated stratum.

3.11 Hemlock Dominated Strata

3.11.1 Objectives

Members of the St. Anne stakeholder group stated concern about the future viability of Hemlock on the York license. St. Anne will strive to maintain the Hemlock vegetation community in a viable condition.

3.11.2 Harvest Prescriptions

Due to the inability of hemlock to regenerate post-clearcut, alternate harvest treatments will be used where possible to ensure the future viability of the Hemlock forest community.

Hemlock dominated stratum are variable in stand structure, species composition, and volume, however they were all allocated for selection cut. From photo interpreted attributes, it is impossible to form strata with potential for only selection cut or clearcut. The exact location and level of treatments in the field will have to be determined from pre-harvest assessment.

The selection cut treatment will be utilised in young to overmature stands of varying volume. All stands will be managed to encourage the establishment of hemlock natural

regeneration. The first entry will remove non-hemlock species, produce small openings, encourage the establishment and growth of younger hemlock stems, and encourage natural hemlock regeneration. Re-entry is on a 30-year cycle with a volume removal of 50 m^3. Treatment windows are included in Appendix 3.

Planting and pre-commercial thinning to produce Hemlock strata is not a viable option but where possible in pre-commercial thins quality hemlock will be favoured.

4.0 OLD SPRUCE/FIR HABITAT

4.1 Objectives and General Description

Sixteen species of vertebrate wildlife depend on, or strongly prefer mature and overmature softwood forest to provide their life requisites. Objectives for OSFH have been developed to meet this need on Crown Land in New Brunswick.

4.1.1 Background

To be considered OSFH, individual stands must have a specific stand structure, be in a specific age range and be spatially arranged to form relatively contiguous blocks of mature softwood forest. When considered independent of their spatial association with other stands, old spruce/fir forest is described as forming Gross OSFH. When spatial arrangement is considered, these areas are termed Net OSFH.

These Gross and Net OSFH definitions used in the management plan were developed by the DNRE and are described in detail as follows:

Gross OSFH (aspatial)

As described in Section 2.3, timber volume yield curves are developed for each forest strata used in the management plan. All stands are assigned to a stratum and an associated yield curve at a specific initial age. Each yield curve is assessed for its suitability as OSFH and assigned a habitat window (the time period along its development when it provides OSFH) based on rules established by the Fish and Wildlife Branch of the Department of Natural Resources and Energy.

Net OSFH (Spatial)

To be considered as Net OSFH, stands meeting the aspatial criteria described above must be suitably arranged on the landscape. The spatial criteria for Net OSFH are as follows:

- OSFH Blocks should contain $\geq$ 375 ha of stands meeting stand level habitat criteria (outlined above).
- A minimum of 75% of the OSFH Block should be of stands that meet habitat criteria.
- OSFH block width must normally exceed 1000 m and always exceed 500 m.

4.1.2 OSFH Objectives

In 1992, the License 8 MCFH objective was set at 7,143 ha based on preservation of 10% of the existing softwood forest. The OSFH objective was based on the MCFH level. This equates to 7,140 ha, 6,720 hectares from ecoregion 5 and 420 ha from ecoregion 7. Also as part of the planning process, the Gross OSFH objective required to achieve this Net OSFH level was determined to be 27,560 hectares (see Section 4.3 for calculations).

4.2 OSFH Management Strategy

OSFH Objective for Ecoregion 7

The portion of ecoregion 7 that falls in the York License is in the Tracy – Tracyville area. The eastern portion of the landbase along the Oromocto River is highly fragmented. The central portion of the landbase in the Three Tree Creek – Tracyville area is characterised by low volume stands that were ravaged by the budworm in the 70's and early 80's. The western portion of the landbase is a continuous block, but is highly fragmented by wetland and non-productive forest, mixedwood and hardwood stands and recent harvest blocks.

The OSFH objective for ecoregion 7 was set at 420 ha. The only candidate for a present OSFH block was in the Three Tree Creek – Tracyville area adjacent to DWA455401 - Shaw Creek. The DWA is 406 ha in size, and has ground level cruise data and a DWA management plan completed. From the plan it is obvious the DWA is characterised by low volume softwood stands, along with a lot of mixedwood and hardwood. Over the next 35 years, this 406 ha yard will only contribute, at maximum level, 158 ha of severe deer winter habitat (SDWH). The maximum level of SDWH over the entire 80-year planning horizon is 206 ha. The low proportion (50.7%) of potential severe deer winter habitat relative to the total area of the DWA does not indicate good potential for OSFH. There is no way that a block could be designed that would meet the spatial objective of 75% of stands meeting OSFH criteria.

The OSFH objective of 420 ha from ecoregion 7 is not available now or in the immediate future however there is a block with potential to provide OSFH in fifty (50) years. The block is in the Three Tree Creek area. Part of the area was highly damaged by budworm in the late 70's and early 80's, clearcut in the early to mid 80's, regenerated naturally to softwood and pre-commercially thinned to fir/spruce/mixed hardwoods in the late 90's. The remainder of the area is in DWA and is mature softwood now. The combined area could produce an OSFH block in the future. Detail on the block is included in table 4.1.

Table 4.1 Future OSFH block in Ecoregion 7 Three Tree Creek.

Landbase	Block # or DWA #	Treatment	Age @ 2002	Area (ha)
General - Cut	32	Pct96-97	20	152
General - Cut	179-1	Pct97-98	15	73
General - Cut	179-2	Pct99-00	15	16
General - Cut	196-2	Pct99-00	15	30
DWA	455501	Natural	Mature	92
DWA	455401	Natural	Mature	60
Total				***423***

OSFH Objective for Ecoregion 5

Since the OSFH objective for ecoregion 7 is not presently available from ecoregion 7, it must be found in ecoregion 5. The OSFH objective for ecoregion 5 now becomes 7,140 ha. In the 1997 Management Plan eleven MCFH blocks were identified and approved as meeting the Net MCFH objective for the next 35 years. These blocks were first identified in 1992, were amended in 1997, and are recognised by St. Anne and DNRE Region as the best OSFH blocks available. These OSFH blocks are all located in ecoregion 5.

These potential OSFH blocks have different sources of inventory data. Three of the potential OSFH blocks with DWA overlap have actual ground level cruise and approved DWA management plans available for the whole block. Two of the potential OSFH blocks with DWA overlap have actual ground level cruise and approved DWA management plans available for part of the block. Four of the potential OSFH blocks with DWA overlap have only 2002 forest characterisation. The remaining two potential OSFH blocks are exclusive of DWAs and have only 2002 forest characterisation.

New OSFH projections for the eleven MCFH blocks were made based on the 2002 forest characterisation developed in this management plan. For planning purposes, due to OSFH-DWA overlap, OSFH was divided into 3 landbases:

- OSFH no DWA overlap
- OSFH-DWA overlap north of St. John River
- OSFH-DWA overlap south of St. John River

Details on OSFH projection, results, and summaries for comparison are summarised in Appendix 4. The level of projected OSFH, based only on 2002-forest characterisation, indicates that the overall objective of 7,140 ha is not met in period one and two but is met in period three and beyond. The projected levels are listed in Table 4.2. The spatial objective is a minimum of 75% (Appendix 4) of the OSFH block must be in stands that meet habitat criteria. The spatial objective is not met based on 2002 characterisation. However, the level of projected OSFH, based on 2002-forest characterisation and utilising actual habitat projections from DWA plans, indicates that the spatial objective is met in period 3 and beyond. OSFH projection based on actual cruise are higher than OSFH projection based on 2002 forest characterisation. OSFH block summaries are provided in Appendix 4.

Based on trends in projected OSFH from actual DWA plans, St. Anne feels that the existing MCFH Blocks are the best blocks available to fulfil the OSFH objective for the License.

4.2.1 Net OSFH and Wood Supply Summary

Clearcut and selection cut harvesting are proposed in the OSFH blocks. This timber harvesting reduces the habitat supply from OSFH Blocks by 1.9% in period one to 2.4% in period two. Due to the heavy overlap with DWA and the harvest in DWA to improve future Severe Winter Deer Habitat (SWDH) and Moderate Winter Deer Habitat (MWDH) there is a small loss of OSFH. Although many of the stands targeted for removal are neither SWDH, MWDH nor OSFH there are some exceptions. An important exception is the Black Spruce strata that contribute to OSFH but do not provide SWDH. In the License level Management Plan, in DWA – OSFH overlap areas, these strata would be scheduled for cut because they do not contribute to SWDH or MWDH. In the actual DWA Management plans prepared for each DWA from ground cruise data, high volume spruce stands, whether red spruce or black spruce, are not scheduled for harvest. Some of the black spruce stands proposed for harvest in the aspatial management plan will never be cut, thus providing OSFH.

Table 4.2. Summary of Net OSFH Supply, Periodic Aspatial Wood Supply, and Harvest Interventions within the OSFH Landbase.

Management Period	1	2	3	4	5	6	7
Net OSFH Supply with no harvest intervention (ha)	6,935	7,235	7,435	7,480	7,580	7,610	7,685
Net OSFH Supply with Harvest Intervention (ha)	6,800	7,060	7,235	7,170	7,145	7,140	7,140
OSFH(only) Aspatial Hwd Supply(m^3)	13,455	7,470	2,270	6,505	6,230	16,150	21,865
OSFH (only) Aspatial Swd Supply (m^3)	14,665	8,360	845	6,005	8,755	10,080	20,745
OSFH(only) Clearcut (ha) Selection (ha)	255 0	155 5	40 0	170 0	145 0	105 150	140 205
OSFH (only) Plant (period) Space (period)	50 75	50 5	0 110	55 135	40 105	40 85	35 155
Annual Harvest Hwd Swd	2,690 2,935	1,495 1,670	455 170	1,300 1,200	1,245 1,750	3,230 2,015	4,375 4,150
Annual Silv. Plant (ha) Space (ha)	10 15	10 0	0 20	10 25	10 20	10 15	5 30

The OSFH blocks contribute significant wood volume in periods one, six and seven with lesser amounts in periods two to five. The estimate of aspatial wood supply from the non-DWA portion of OSFH is 13,455 m^3/period of hardwood and 14,665 m^3/period of softwood in period one (Table 4.2). The harvest level for period two, four and five is at about 50% of the period one level. The low is in period three with projected harvest levels of 2,270 m^3 of hardwood and 845 m^3 of softwood. The harvest levels in period six are comparable to period one levels, and in period seven the levels are almost double. The harvest is mainly clearcut with 255 ha proposed for period one. There is selection cuts scheduled for periods six and seven. The gross OSFH objective and levels is provided in figure 4.1.

4.3 Gross OSFH Objective and Supply

The Gross OSFH objective applies to years 36 to 80 of the management plan. The objective is calculated using the formula:

Gross OSFH Objective = Net OSFH Objective (ha) x Gross: Net OSFH Ratio where:
Net OSFH Objective = 7,140 ha
Gross/Net OSFH Ratio = Minimum Gross OSFH level in the first 35 years
Net OSFH level for the same period.

The lowest supply of Gross OSFH occurs in Year 25. Only identified OSFH blocks provide Net OSFH. The Net OSFH habitat supply in Year 25 is 7,177 ha. Without concern for location, the Gross OSFH habitat supply in year 25 from the whole forest is 27,673 ha. With these values the Gross/Net OSFH ratio and Gross OSFH objective are calculated as follows:

Gross/Net OSFH Ratio = 27,673 ha of Gross OSFH ÷ 7,177 ha of Net OSFH
= 3.86

Gross OSFH Objective = 7,140 x 3.86
= 27,560

Figure 4.1 shows how the Gross OSFH supply remains relatively constant while never falling below the objective of 27,560 ha.

4.4 Age Class Structure for the OSFH Landbase

The majority of the OSFH landbase is in stands over 60 years of age (fig. 4.2). Only 12% of the landbase is younger than 50 years. If these OSFH areas were to be held beyond thirty-five years, this small amount of young stands contributing to OSFH would result in a shortage of OSFH in the future. Harvesting and follow up silviculture in non-habitat stands could be used to produce stands that have potential for future habitat.

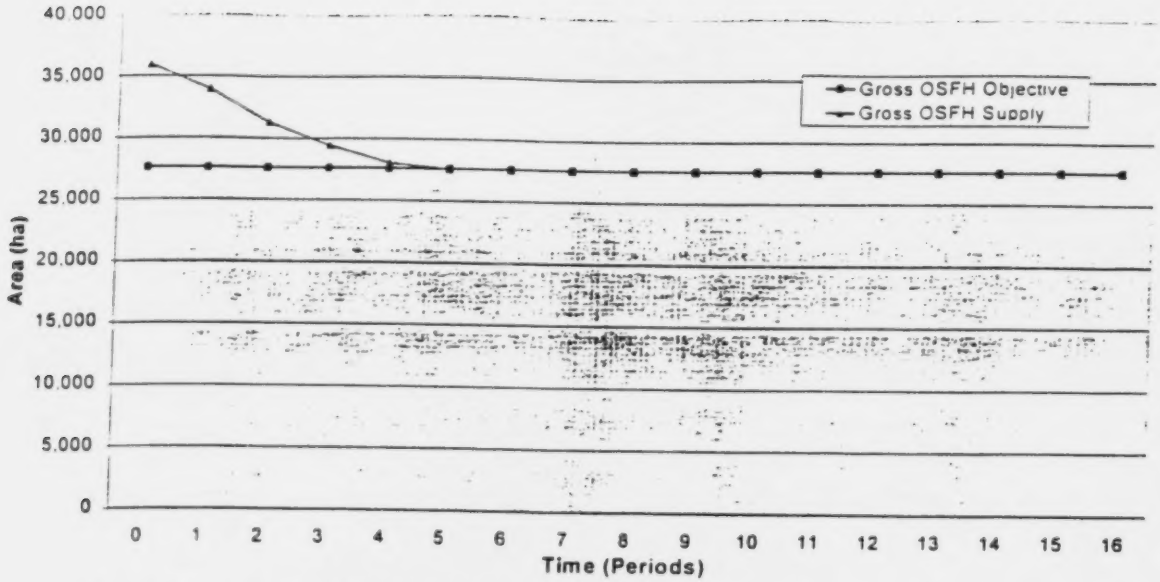

Figure 4.1. Gross OSFH objective and supply on License 8 (aspatial).

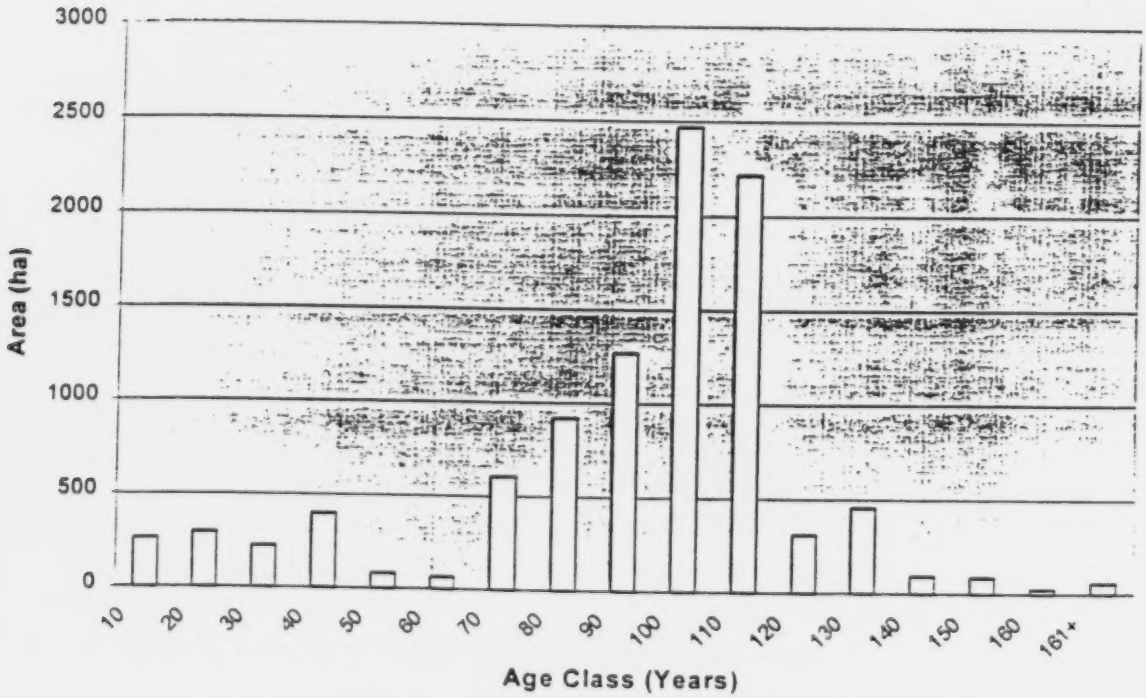

Figure 4.2. Age Class Distribution for the OSFH Landbase.

5.0 DEER WINTERING AREAS

5.1 Objectives

The management objective, for the identified DWA landbase on License 8, is to provide the maximum supply of Severe Winter Deer Habitat (SWDH) north of the St. John River, and to provide the maximum supply of Moderate Winter Deer Habitat (MWDH) south of the St. John River. This was achieved by balancing age class distributions and minimising the time stands are not supplying habitat conditions within individual deer wintering areas. This section of the management plan provides a strategic forecast of deer habitat management activities, predicted habitat supply and associated harvest levels. Ultimately levels of habitat by type and harvest levels are dependent on the development of individual DWA Management Plans

5.2 Landbase Description

The DWA landbase has been located and mapped through ground and aerial surveys by DNRE. There are 109 individual DWAs identified totalling 26,114 ha (24,461 ha of productive forest). As determined from forest inventory data, the age class structure (figure 5.1) of the DWA landbase is skewed to older development stages (80 to 110 years). Also the same graph shows there is starting to be a significant portion of the landbase in younger age classes (0 to 40 years) that will provide future habitat.

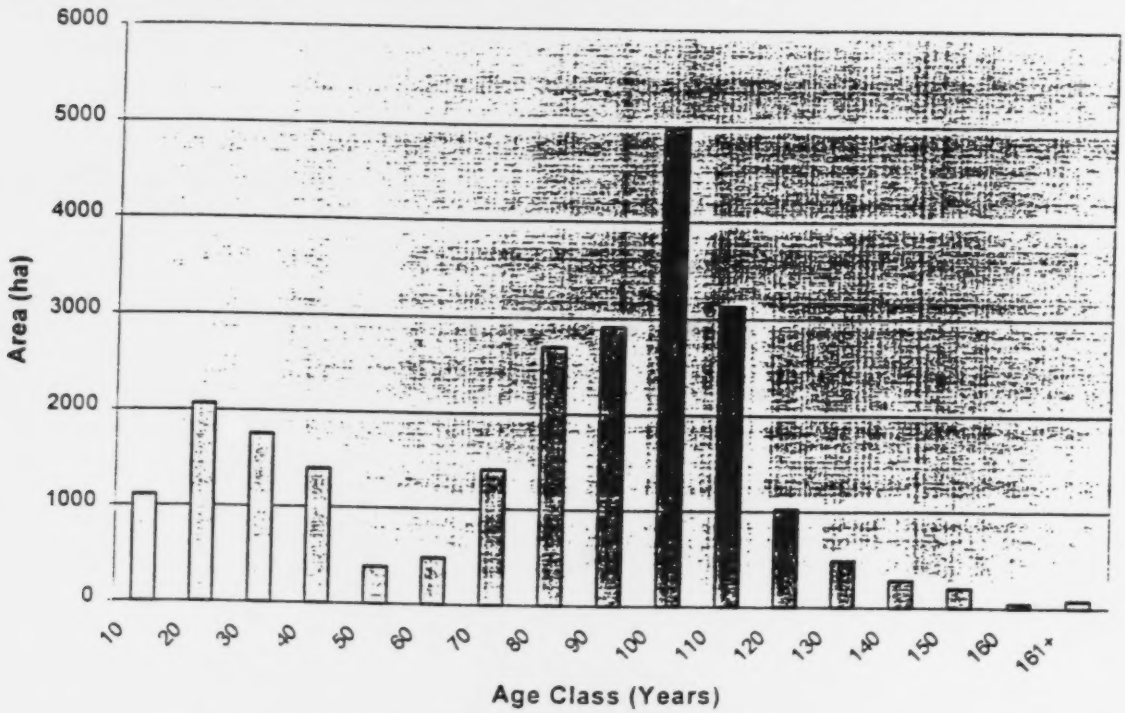

Figure 5.1. Age Class Distribution for the Total DWA landbase.

There is 11,627 ha of DWAs from 1992 to 2002 that require follow-up management plans in period one (2002-2007). A list of individual DWA Mangagement plans proposed for continuances in period one are provided in Appendix 5. There is 6,721 ha of DWAs proposed for new management plans in period one. A list of individual DWA Management plans proposed for period one is provided in Appendix 5.

The DWAs have been divided into two landbases. Potential habitat supply and available harvest volume have been reported for the two landbases.

Landbase 1: North of St. John River

The total productive DWA landbase for license 8 is 24,461 ha (26,114 ha total), of which 11,447 ha are north of the St. John River. Of the total area of 11,447 ha, 5,412 ha have individual DWA management plans in place. A list of individual DWAs with completed plans is provided in Appendix 5. It is proposed that 2,546 ha of individual DWA management plans be produced during period one (2002-2007). A list of DWAs proposed for management plans in period one is included in Appendix 5. In period two (2007-2012), the remaining plans for 3,485 ha of DWAs will be completed.

Landbase 2: South of St. John River

The total productive DWA landbase for License 8 is 24,461 ha (26,114 ha total), of which 13,013 ha are south of the St. John River. Of the total area of 13,013 ha, 6,838 ha have individual DWA management plans in place. A list of individual DWAs with completed plans is provided in Appendix 5. It is proposed that 3,553 ha of individual DWA management plans be produced during period one (2002-2007). A list of DWAs proposed for management plans in period one is included in Appendix 5. In period two (2007-2012), the remaining plans for 2,615 ha of DWAs will be completed.

5.3 Habitat and Wood Supply

Intervention (harvest and silviculture) has a positive impact on both SWDH and MWDH as indicated in Figure 5.2 and Figure 5.3. The projected level of SWDH in period sixteen with harvest and silviculture is 6,522 ha versus 1,640 ha with no interventions. SWDH due to its age and forest structure will decline initially but can be enhanced over time by conversion of non-habitat to conditions with habitat potential through harvesting, planting and pre-commercial thinning. The projected level of MWDH in period sixteen with harvest and silviculture is 14,400 ha versus 9,670 ha with no interventions. MWDH due to its age and forest structure will increase naturally over time and is less impacted by harvest, planting and pre-commercial thinning.

The projected wood supply from the total DWA landbase is 92,850 m^3 of softwood and 55,900 m^3 of hardwood in period one. The projected annual cut is 18,600 m^3 of softwood and 11,200 m^3 of hardwood in period one. Note: In DWAs hemlock and cedar,

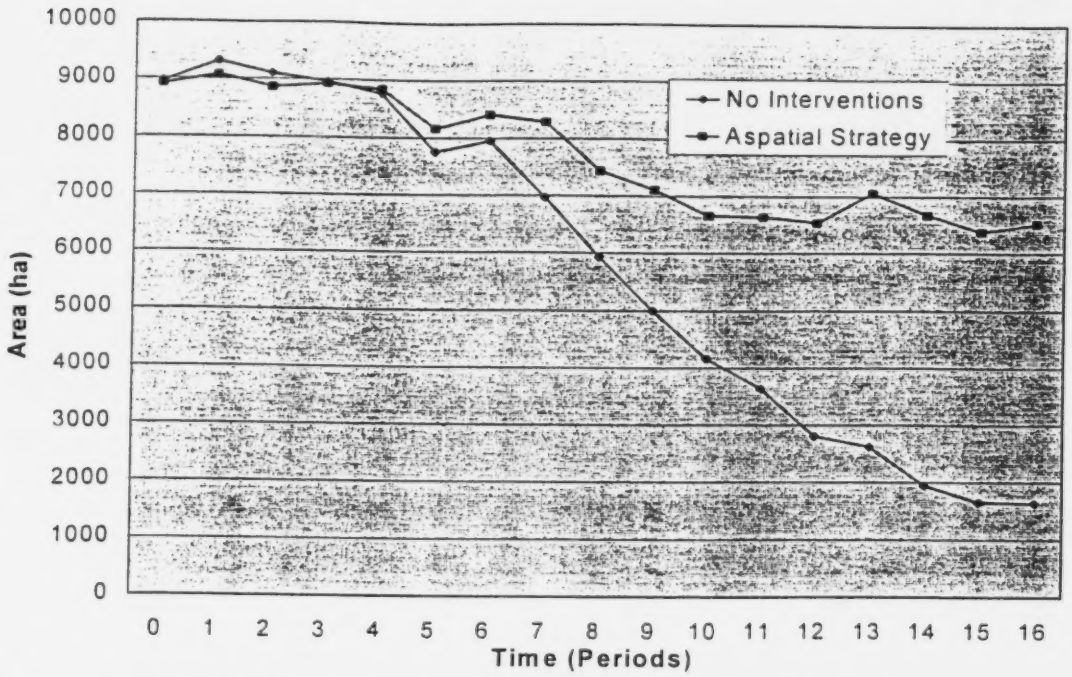

Figure 5.2. Severe Winter Deer Habitat for DWA Landbase.

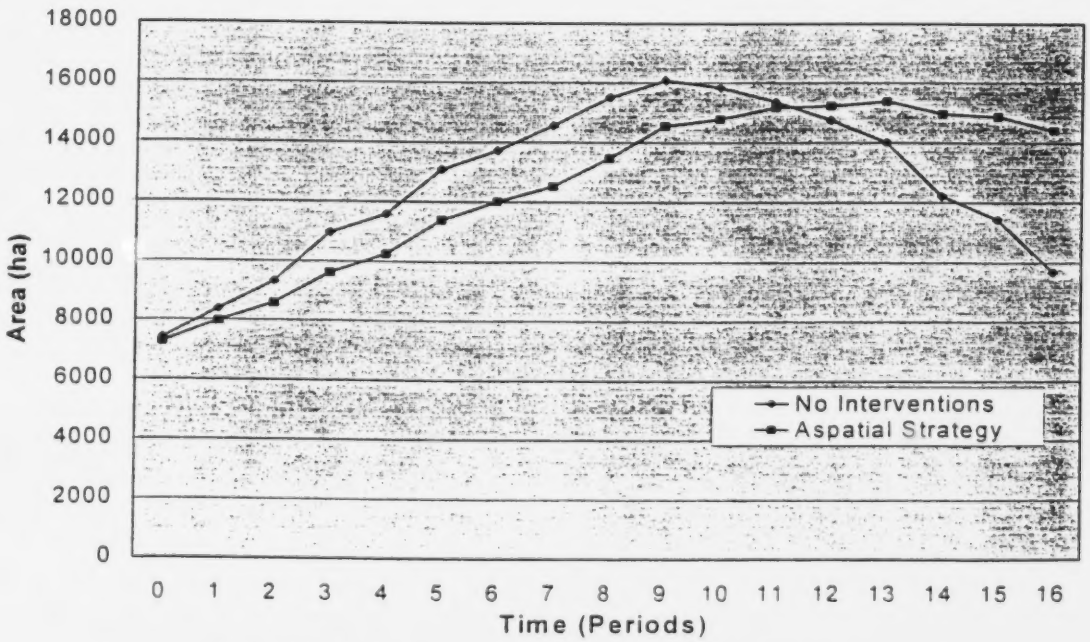

Figure 5.3. Moderate Winter Deer Habitat for DWA Landbase.

because of their importance to deer, are left standing to ensure that these species are part of the future forest.

From analysis of actual hardwood volumes harvested from DWAs cut between 1997 and 2002, it is apparent the hardwood volume projected to be generated from DWAs for that period was underestimated. The analysis indicates that more hardwood could be harvested from the DWAs than the levels projected. Based on this analysis, the projected harvest level for hardwood from DWAs was increased to 102,500 m^3 for period one or 20,500 m^3 per year (see appendix 9 for details).

5.3.1 Landbase One: North of the St. John River

The projected wood supply from DWA landbase one north of the St. John River is 44,320 m^3 of softwood and 33,920 m^3 of hardwood in period one (table 5.1). The projected annual cut is 8,865 m^3 of softwood and 6,785 m^3 of hardwood in period one. Silviculture, both planting and spacing, are proposed. Hardwood harvest level will be increased from 6,785 m^3/year to 12,400 m^3/year (see explanation in 5.3 *Habitat and Wood Supply*).

The objective north of the St. John River is to first maximise SWDH then maximise MWDH. Projected levels of SWDH stay constant between periods one and four then drop until period eleven, after which it increases until the end of the planning horizon (table 5.1). This is consistent with the pattern for the whole DWA landbase shown in Figure 5.2. It begins at 4,981 ha and ends the 80-year planning horizon at 4,147 ha.

Table 5.1. DWA Harvest, Silviculture and Habitat Levels North of the St. John River.

Year	Harvest Level (m^3)		Silviculture Level (ha)		Habitat Levels (ha)	
	Softwood	Hardwood	Planting	Spacing	Severe	Moderate
5	44,320	33,920	20	290	4,981	4,205
10	52,720	30,590	140	190	5,042	4,351
15	27,790	21,900	0	466	5,042	4,961
20	15,530	9,900	80	315	5,046	5,191
25	24,210	15,460	40	300	4,752	5,643
30	107,670	117,220	110	145	4,683	5,767
35	75,330	41,790	205	200	4,254	5,840
40	32,180	25,610	90	565	3,885	5,942
45	28,210	5,630	55	375	3,758	6,357
50	40,140	33,970	20	120	3,609	6,426
55	21,250	10,350	0	60	3,606	6,657
60	37,430	22,010	50	70	3,711	6,593
65	45,950	36,470	40	0	3,946	6,702
70	88,790	50,610	60	40	3,919	6,564
75	49,130	23,140	45	10	4,046	6,648
80	34,750	19,670	135	45	4,147	6,424

5.3.2 Landbase Two: South of the St. John River

The projected wood supply from DWA landbase two south of the St. John River is 48,530 m^3 of softwood and 21,980 m^3 of hardwood in Period one (table 5.2). The projected annual cut is 9,705 m^3 of softwood and 4,395 m^3 of hardwood in Period one. Silviculture, both planting and spacing, are proposed. Hardwood harvest level will be increased from 4,395 m^3/year to 8,100 m^3/year. See explanation in 5.3 Habitat and Wood Supply.

The objective south of the St. John River is to first maximise MWDH then maximise SWDH. Projected levels of MWDH increase from period one to period thirteen, then decline slightly (8%) until the end of the 80-year planning horizon (table 5.2). This is consistent with the pattern for the whole DWA landbase in Figure 5.2. Projected levels of SWDH peak in period one then decline until the end of the 80-year planning horizon. SWDH begins at 4,294 ha and ends the 80-year planning horizon at 2,375 ha (table 5.2).

Table 5.2. DWA Harvest, Silviculture and Habitat Levels South of the St. John River.

Year	Harvest Level (m^3)		Silviculture Level (ha)		Habitat Levels (ha)	
	Softwood	Hardwood	Planting	Spacing	Severe	Moderate
5	48,530	21,980	25	90	4,294	3,870
10	48,310	39,620	190	275	3,950	4,310
15	19,190	25,420	0	340	3,996	4,823
20	23,310	10,690	90	555	3,842	5,142
25	28,660	11,320	35	350	3,463	5,954
30	38,550	29,280	95	180	3,792	6,282
35	18,660	9,230	30	150	4,047	6,763
40	48,530	14,620	55	135	3,580	7,515
45	30,390	7,620	90	60	3,398	8,111
50	25,860	21,260	90	250	3,144	8,284
55	20,500	14,820	0	85	3,072	8,524
60	36,250	16,030	75	185	2,841	8,625
65	19,390	24,440	60	35	3,212	8,677
70	37,640	20,470	70	45	3,706	8,396
75	59,340	35,970	30	35	2,386	8,112
80	32,530	22,450	145	230	2,375	7,976

Table 5.3 shows the projected SWDH area from Actual DWA Management Plans. For the purpose of comparison with the aspatial plan for the DWA landbase these values were adjusted to reflect the total area of DWA in License 8 (table 5.4). The projected habitat levels from 2002 forest characterisation are significantly lower than the projections using actual cruise data. The projection of SWDH from 2002 forest characterisation is approximately 9,000 hectares versus approximately 11,000 hectares from actual cruise data.

Table 5.3. Projected SWDH Area from Actual DWA Management Plans.

Location	DWA Area	Period				
		97-02	02-07	07-12	12-17	17-22
South of River	6,838	3,219	3,296	3,356	3,473	3,555
North of River*	4,789	2,074	2,085	1,997	2,084	2,257

* Excluding DWAs 444501, 444502, and 444504 at Tay River.

Table 5.4. Projected SWDH for the Whole DWA Landbase Area from Actual DWA Management Plans.

Location	DWA Area	Period				
		97-02	02-07	07-12	12-17	17-22
South of River	13,006	6,120	6,270	6,385	6,605	6,760
North of River	11,442	4,955	4,980	4,770	4,980	5,390
Total	24,448	11,075	11,250	11,155	11,585	12,150

6.0 WATERCOURSE BUFFERS

All watercourses on License 8 with a channel width of 0.5 metres and wider require a buffer strip to be established around them. Buffers are designed to protect both water quality and aquatic habitat.

6.1 Buffer Widths by Feature

The buffer width on License 8 varies with the width of the watercourse (i.e. wider watercourses require wider buffers). Watercourses are mapped in the provincial forest inventory database. They appear as either single lines (width of the watercourse is such that it is represented by a single line at a scale of 1:12,500), double lines, or as named Rivers. The width of buffers, on single line streams, double line streams and rivers are based on the average width of existing buffers on that feature. Operationally buffer widths vary on same type streams depending on the environmental sensitivity of the stream and the purposes for maintaining the buffer. Based on a study of stream buffers actually established during operating year 1997-1998, the buffer width on single line streams was increased from 28 meters to 40 meters. The buffer on double line streams, rivers and lakes was unchanged. Standing timber buffers, that were applied to License 8 for the 1997 Management Plan, but were not applied on all Licenses, were discontinued. Provincial highway buffers of 30 meters were applied to all numbered highways on the license for the first time. Table 6.1 lists the buffer widths by feature type.

Table 6.1. Mapped Buffer Widths by Feature Type on License 8.

WATERCOURSE TYPE	BUFFER WIDTH (metres)
Single Line	40
Double Line	61
River	107
Lake	100
Provincial Numbered Highways	30

6.2 Harvest Prescription

Harvesting will take place in buffers to within 15 m of the watercourse, however no buffers will be clearcut. A modified selection harvest will be prescribed whereby no more that 30% of the volume will be removed, maintaining on average 18 m^2/ha basal area. The volume removed will come from the older, less stable spruce/fir trees within the buffer. This will promote buffer stability and regeneration.

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6.3 Summary of Harvest Volumes

Table 6.2 shows the level of estimated harvest from buffers based on past history for harvesting in that condition.

Table 6.2. Annual Allowable Cut from Buffers on License 8.

LAND BASE	VOLUME FROM BUFFERS	
	Spruce, Fir & Jack Pine	Hardwood
General Forest	2,000	100
Total	2,000	100

7.0 RECREATION

A requirement of the 2002 management plan is to maintain the integrity of existing recreational sites. Recreation is an important component of the management of License 8 and is focused in 7 main areas:

(I) Oromocto Lake - Boat Landings
(ii) Magaguadavic Lake - Boat Landing
(iii) Nashwaak River and surrounding area: salmon fishing, hunting
(iv) Skiff Lake: visual integrity
(v) Public Access: designated roads are maintained and kept open for public travel
(vi) Snowmobile Trails - designated trails are recognised and respected
(vii) Camps - recognised and respected with adequate buffers

Specific sites have been identified on the maps and harvesting has been co-ordinated in such a way so as not to compromise the integrity of these recreational areas.

The public is welcome on crown lands.

8.0 UNIQUE SITES

Unique sites include areas of ecological, historical, cultural or scenic value. The 2002 management planning requires that unique sites be protected and preserved. The following unique sites have been identified on the License:

(I) Rocky Brook Stairs - unique section of Rocky Brook consisting of a distinct gorge, a distinct change in stream flow rate and flow direction, and a number of falls and rapids.

(ii) Lily Lake - Red Pine Stand - unique natural stand of fire origin Red Pine approximately 85 years old. This is the only Red Pine stand in the Pokiok area.

(iii) Scotch Settlement - Gravesite - site of failed early Scots settlement. Small monument plus markers to commemorate lost gravesite. Also signs of old basements.

(iv) Mature Tolerant Hardwood Stand – adjacent to Grand John camp cluster – site is an excellent example of the diverse vegetation associated with mature tolerant hardwood stands.

Each of these areas has been identified on the maps and buffers (no harvest) have been established around each. Future unique sites that are identified, verified and approved will be respected.

9.0 LONG TERM FOREST INDICATORS

9.1 Vegetation and Habitat Community Objectives

In "A Vision for New Brunswick Forests...Goals and Objectives for Crown Land Management", minimum area objectives were set for selected vegetation and habitat communities. These area objectives unlike the OSFH objectives are not spatial. The vegetation community objectives are expressed as area in old and/or large stages of development. The objective level for vegetation communities is equivalent to 12% of 1982 provincial inventory levels, which were adjusted for human disturbance. The habitat objectives are based on maintaining viable populations of all species. These vegetation and habitat objectives required constant monitoring through strategy development to ensure levels were not compromised over the planning horizon. Vegetation and habitat levels achieved are provided in Appendix 6 for the 80-year planning horizon.

9.1.1 Discussion

The objective levels for the following vegetation and habitat communities were monitored for the 80 year planning horizon.

- Vegetation Community: THP, THSW, SP, BS, EC, PINE
- Habitat Community: OPIH, OHWH, OSFH, OMWH, OTHH, LMWH

The objective levels for OSFH and how the objectives were met is discussed in detail in section 4.0 Old Spruce/Fir Habitat.

All other objectives were met in all periods with the exception of THSW. The objective levels for the THP and THSW vegetation communities were monitored for the 80 year planning horizon and are not met at present but will be met in the future as follows:

1) The THSW objective in ecoregion five is 2,930 ha. The THSW objective in ecoregion five is attainable in period three and throughout the remainder of the planning horizon. The level at present is 2,155 ha while the level in period 1 is 2,813 ha.

2) The THSW objective in ecoregion seven is 320 hectares. The THSW objective in ecoregion seven was only attainable between period eleven and thirteen. At period one there is only 225 ha. By period eleven there is 336 ha, but by period fourteen it is back down to 298 ha. Stands do not contribute to the objective until they are 80+ years of age. There are no interventions including silviculture that can create THSW within the 80 year planning horizon.

During implementation of the management plan (operational) stands not contributing to the THSW objective, but that are identified as stands that have the species composition and age to contribute to the objective, will be set aside. When identified, up to 117 ha will be set aside in ecoregion five and up to 95 ha in ecoregion seven.

Table 9.1. Vegetation and Habitat Objectives.

Vegetation and Habitat Community	Constraining Objective by Ecoregion (ha)	
	5	7
THP (vegetation)	1,970	0
THSW (vegetation)	2,930	320
SP (vegetation)	6,200	300
BS (vegetation)	0	130
EC (vegetation)	1,540	80
PINE (vegetation)	200	0
OPIH (habitat)	430	0
OSFH (habitat)	6720	420
OTHH (habitat)	4470	0
OHWH (habitat)	1,420	130
OMWH (habitat)	6,180	490
LMWH (habitat)	1,150	100

THP – Pure Tolerant Hardwood – SW < 50%; TH >= 20%; TH+RM >= 75%
THSW - Tolerant Hardwood-Softwood - SW < 50%; TH >= 20%; TH+RM >= 35% and < 75%
SP – Pure Spruce and Spruce Mix (Red and White Spruce) – SW>= 50%; SP >= 35%
BS – Black Spruce - SW>= 50%; BS >= 35%
EC – Cedar - SW>= 50%; EC >= 35%
PINE or OPIH – Red and White Pine - SW>= 50%; PI >= 35%
OSFH – Old Spruce-fir Habitat – Vegetation Communities SP, BF, BS, EC – Old or Large stages
OTHH – Old Tolerant Hardwood Habitat – Vegetation communities THP, THSW – Old stages
OHWH – Old Hardwood Habitat – Vegetation communities IHSW, THP, THSW – Old or Large stages
OMWH – Old Mixedwood Habitat – SW >= 25% and < 75% – Old or Large stages
LMWH – Large Mixedwood Habitat - SW >= 25% and < 75% – Large stages

9.2 Piece Size

Piece size refers to the average stem diameter of harvested trees and is important to monitor because of its impact on the sawmill industry. As Figure 9.1 illustrates, over the next 25 years the average piece size will fluctuate from a high of .15 m^3/tree in period one, two and five to a low of .14 m^3/tree in period three and four. For the whole eighty year planning horizon the average piece size fluctuates from a high of .19 m^3/tree in period six to a low of .13 m^3/tree in period sixteen. The larger sawmills have already adapted to smaller piece sizes.

The change in hardwood piece size is not considered a problem in future management of the License, since higher quality hardwood stands have been placed under uneven-aged management, and any regenerating stands with potential will be placed under uneven-aged management. The problem of quality production in the future has been addressed. From a hardwood pulpwood perspective future piece size is not considered an issue.

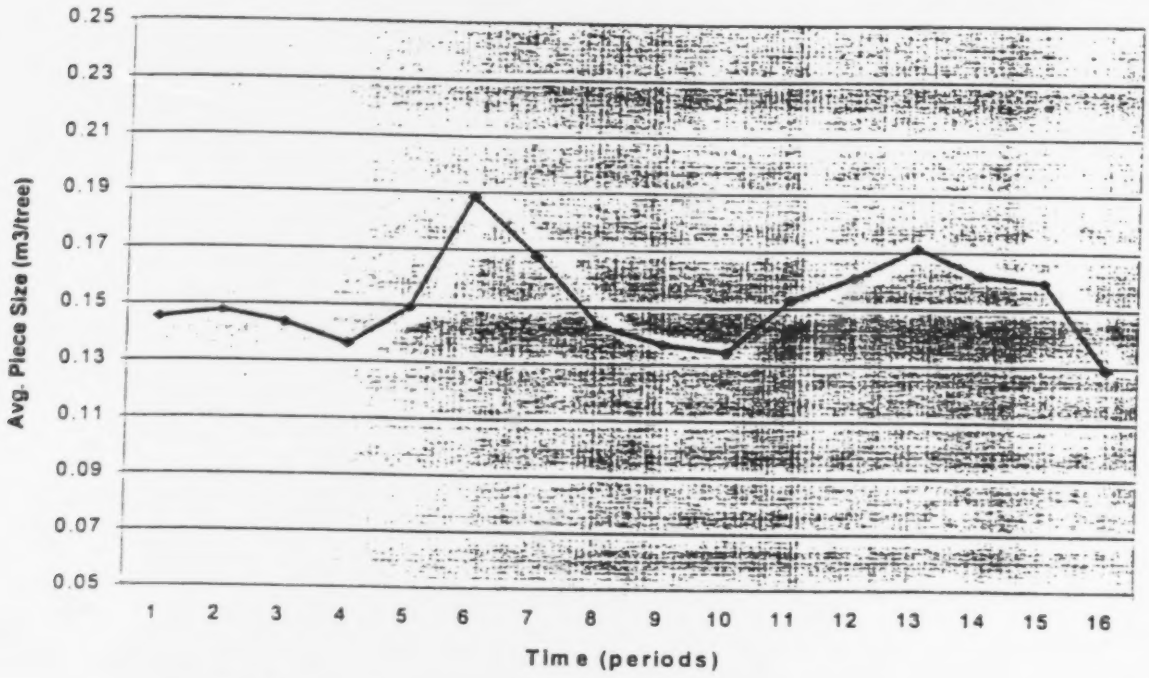

Figure 9.1. Average Piece Size of Harvested Spruce – Fir.

9.3 Harvest Prescriptions

As detailed in earlier sections of this management plan, a variety of harvesting prescriptions will be employed on License 8 over the next 80 years. Clearcutting is still the dominant treatment with lesser amounts of alternate harvesting. Commercial thinning will begin in period 1 (2002-2007) and will continue over the remainder of the 80 year time horizon. Selection harvesting will continue over the eighty (80) years, but at a low volume level. Two-pass shelterwood and strip cut harvesting will be utilised predominantly in early periods of the planning horizon.

In Spruce or Fir dominated strata clearcut is the most important (almost exclusive) treatment, with much less individual levels of selection cut, strip cut and two-pass

shelterwood. In the tolerant hardwood dominated strata, selection harvesting is the most important treatment with lesser individual levels of stripcut, two-pass shelterwood and clearcut. In the intolerant hardwood dominated strata clearcut is the most important (almost exclusive) treatment. In the cedar dominated strata (stratum with > 35% cedar) selection cut is the most important treatment with lesser individual levels of strip cut and clearcut. In Pine and Hemlock dominated strata (stratum with >35% Pine and/or Hemlock) selection cut or patch shelterwood will be the only treatment.

10.0 Discussion

10.1 Problems arising since the 1997 Management Plan.

1) In the 1997 Management Plan the general forest was split into a softwood forest and a hardwood forest. That split added an unnecessary level of complexity to both the planning and implementation stage of the management plan. For the 2002 management plan the whole general forest will be handled as one forest.

2) In implementation of the 1997 Management Plan, there has been a volume short fall, especially in softwood, from period 1 harvest blocks. To address the problem the following steps have been taken:
   - A new set of cover type definitions was developed that better reflect the structure of forest stands.
   - The landbase was again stratified and new yield curves were produced utilising new FDS plot data and a new version of STAMAN, calibrated using the most recent permanent sample plot (PSP) data.
   - Actual buffer widths on the ground were assessed. Based on the study the buffer width of single line streams in the landbase was increased from 28 meters to 40 meters (a 43% increase).
   - A wider range of harvest treatments has been planned. The utilisation of harvest treatments such as two-pass shelterwood and strip cut in areas scheduled for clearcut has resulted in the loss of some volume.
   - Poor site Spruce was removed from the merchantable landbase. Poor site Spruce will not be available for harvest. This amounts to 6,609 ha. If it is found to be operable, it will be a bonus.
   - Net down of softwood harvest after blocking

3) In the 1997 Management Plan selection cut and clearcut were the only treatments planned in tolerant hardwood and tolerant hardwood/softwood stands. These two treatments were found to be insufficient to address all tolerant hardwood conditions. Two-pass shelterwood and strip cut treatments were added as possible treatments.

4) In the 1997 Management Plan selection cut and clearcut were the only treatments planned in cedar stands. These two treatments were found to be insufficient to address all cedar conditions. Strip cut treatment was added as a possible treatment.

5) In the 1997 Management Plan identified Hemlock was grouped with softwood and available for clearcut. Concerns were raised about the future of Hemlock. In response, identified Hemlock will be harvested only by selection cut.

6) Preservation of the four main cover types (S, SH, HS, H) within 10% of 1997 inventory levels for the 80-year planning horizon was found to be inadequate as a measure of biodiversity maintenance and protection. The biodiversity objective was refined for the 2002 Management Plan to include vegetation community groupings.

7) In implementation of the 1997 Management Plan, actual hardwood yield was found to be higher than Management Planning projections. From comparison of actual harvested hardwood volume with predicted harvested hardwood volume for 1997 and 1998 harvest blocks, the ratio of actual to predicted harvest was 1.2 (Crown land harvest block evaluation conducted by Timber Management Branch, Department of Natural Resources and Energy, March, 2001). Hardwood volume tables were modified for the1997 Management Plan but the hardwood yield issue does not appear to be completely resolved. In the 2002 Management Plan, the issue will be addressed after blocking through a net down or net up.

10.2 Summary of Major Changes from 1997 to 2002

1) The whole existing mature forest was newly stratified. Mature forest refers to all conditions with a development stage (Y, I, M, O). The forest stands were regrouped by ecoregion, ecodistrict and new vegetation communities, along with crown closure, development stage and site. This should better define major differences in stand volume and stand species structure.

2) New yield curves were produced for each new stratum (Y, I, M, O) using the stand level projection model STAMAN3.1. STAMAN was newly calibrated for growth and survival based on the most up to date PSP re-measurements.

3) The forest was re-aged. Actual ages from DWA and MCFH cruises, FDS plots, and PSP's were utilised where available. New inventory, where available, was utilised for ageing stands without actual ages. For plantations and spacings age was calculated from treatment records. For the remainder of the forest ages from 1997 were used or ages assigned based on existing proportions. For validation, distribution of assigned ages was compared to distribution of FDS plot ages.

4) A new transition matrix was created taking into consideration pre-harvest forest conditions, post-harvest response, and potential for silviculture. Fifth year assessment plots were utilised to produce the forecasts of post-harvest response, and potential for silviculture.

5) The 1997-cover type maintenance objective, designed to ensure biodiversity was not compromised. was replaced. The cover type objective was replaced by vegetation

and habitat community objectives. Vegetation and habitat community objectives were established for selected forest stratum or groups of forest stratum. The objectives concentrate on the maintenance of the old and/or large stage of each community at pre-determined levels.

6) Generating even harvest flow of all other softwood (cedar, hemlock, red pine, white pine and larch) over the eighty-year planning horizon was explored. It was found that much of the other softwood is generated from the existing mature spruce-fir and hardwood forest. The spruce-fir and hardwood forest does not regenerate naturally to other softwoods in the same proportions as the original stand. The future forest will have a smaller proportion of other softwood. It is impossible to sustain the harvest levels of other softwoods generated in periods one to five over the whole eighty-year planning horizon.

7) FORMAN+1 forest level projection modelling software was replaced with WOODSTOCK forest modelling software. FORMAN+1 is simulation based while WOODSTOCK allows simulation and optimisation. FORMAN+1 has limitations when dealing with more than one primary species. FORMAN+1 has limitations when controlling and/or monitoring multiple forest level objectives. WOODSTOCK (optimisation) through its objective function and constraints is capable of handling several primary species and many forest level objectives.

8) GIS FORMAN forest level blocking and scheduling model was replaced by STANLEY model. GIS FORMAN, which included strategic and tactical planning in one model, was limited like FORMAN when dealing with multiple species and when controlling and/or monitoring multiple forest level objectives. STANLEY starts with a WOODSTOCK strategic plan and develops a tactical plan with harvest blocks and a schedule for harvest. STANLEY can allow for maximum and minimum block size, green up (number of periods), adjacency (when forming blocks, distance between stands) and proximity (distance between blocks).

9) In the final aspatial strategy, the whole forest was modelled together. The final strategy was optimisation of total harvest volume with non-declining softwood harvest volume (spruce-fir-jack pine), non-declining hardwood harvest volume.

10) Net down of harvest levels after blocking and scheduling was required for the first time. Net down is necessary because proposed harvest blocks from the Management Plan get smaller through the operational planning and harvesting phase. From a study conducted on the License for blocks harvested in 1997,1998, 1999 and 2000, it was found that eighty-two percent (82%) of proposed harvest blocks got smaller. The blocks get smaller for several reasons, including unmapped streams, changes in buffers widths, wildlife concerns, inoperable, boundary changes

and maturity etc. (for detail see Appendix 8). Softwood allowable cut was netted down to account for lost harvest area. Hardwood was not netted down (see next point 11).

11) Hardwood volume from DWAs was adjusted up to account for hardwood over runs from DWAs harvested between 1997 and 2002 (for details see Appendix 9).

10.3 Comparison of 2002 results to 1997

10.3.1. Timber

(A) General forest – Spatial

The change in AAC from the 1997-management plan to the 2002-management is provided in table 10.1. Below are explanations for some of the changes in AAC for some species or species groups. Some changes were made subsequent to modelling completion. Volume adjustment factors pertaining to the following tables are provided in Appendix 10.

Spruce-Fir-Jack Pine Annual Allowable Cut (AAC): General Forest

The softwood AAC for the general forest increased from 122,600 m^3/yr to 129,900 m^3/yr before net down, 118,300 m3/year after net down. This is an increase of 7,300 m^3/yr or 6.0% before net down, and a loss of 4,300 m^3/yr or 3.5% after net down (see Table10.2 and 10.5). This increase before net down is attributed to the new stratification, STAMAN3 generated yield curves and higher levels of commercial thinning. The loss is due to net down.

Hardwood Annual Allowable Cut (AAC): General Forest

The hardwood AAC for the general forest dropped from 150,000 m^3/yr to 136,300 m^3/yr. This is a drop of 13,700 m^3/yr or 9.1% (see Table 10.1). Part of this drop could be attributed to:

- the reduction in timber producing landbase from 71.6% in 1997 to 68.8% in 2002.
- the tolerant hardwood strata being predominantly available for selection cut, strip cut and two-pass shelterwood rather than clearcut.
- new stratification and yield curves.

There is no net down in hardwood

Cedar Annual Allowable Cut (AAC): General Forest

The cedar AAC for the general forest increased from 14,900 m^3/yr to 15,700 m^3/yr but after net down is 14,300 m^3/yr (see table 10.1 and 10.4). This is an increase of 5.4% before net down and a drop of 600 m^3/yr or 4% drop after net down. Cedar dominated strata on the landbase increased from 7,442 ha in 1997 to 9,559 ha in 2002, however the first entry selection cuts in cedar strata generate very little cedar. Most of the cedar harvested is generated as fallout from clearcut of spruce-fir and hardwood strata. To sustain the cedar harvest (AAC) at an equal level over the eighty-year planning horizon results in a significant drop in spruce-fir and hardwood AAC. Levelling cedar AAC over the full planning horizon would result in leaving spruce-fir and hardwood forest, presently available for harvest, until later periods. Due to this negative impact on spruce-fir and hardwood AAC, cedar harvest levels are higher in period one to period five. These early harvest levels can not be sustained over the total planning horizon.

Pine Annual Allowable Cut (AAC): General Forest

The pine AAC for the general forest decreased from 8,100 m^3/yr to 5,700 m^3/yr and after net down is 5,200 m^3/yr (see Table 10.1). This is a decrease of 29.6% before net down and a drop of 2,900 m^3/yr or 35.8% after net down. Pine dominated strata in the database increased from 670 ha in 1997 to 2091 ha in 2002, however the first entry selection cuts in pine strata generate very little pine volume. Most of the pine harvested is generated as fallout from clearcut of spruce-fir and hardwood strata. To sustain the pine harvest (AAC) at an equal level over the eighty-year planning horizon results in a drop in spruce-fir and hardwood AAC. Levelling pine AAC over time would result in leaving spruce-fir and hardwood, presently available for harvest, until later periods. Due to this negative impact on spruce-fir and hardwood AAC, pine harvest levels are higher in period one to period five. These early harvest levels can not be sustained over the total planning horizon.

Hemlock Annual Allowable Cut (AAC): General Forest

The hemlock AAC for the general forest dropped from 6,600 m^3/yr to 5,200 m^3/yr before net down and 4,700 m^3/yr after net down (see Table 10.1 and 10.4). This is a drop of 1,400 m^3/yr before net down and 1,900 m^3/yr or 28.8% after net down. For the 2002 plan, hemlock stands were separated from the spruce-fir strata. These hemlock stands are only available for selection cut. This stratification results in less hemlock available for harvest now. To sustain the hemlock harvest (AAC) at an equal level over the eighty-year planning horizon results in a drop in spruce-fir and hardwood AAC. Most of the hemlock harvested is generated as fallout from clearcut of spruce-fir and hardwood strata. Levelling hemlock AAC overtime would result in leaving spruce-fir and hardwood forest presently available for harvest until later periods. Due to this negative impact on spruce-fir and hardwood AAC, hemlock harvest levels are higher in period one to period five. These early harvest levels can not be sustained over the total planning horizon.

Table 10.1. Comparison of 1997 and 2002 Spatial Annual Allowable Cut (before net down) for License 8.

Forest Product*	General Forest			Total Forest		
	1997	2002*	Difference	1997	2002*	Difference
Spruce-fir	122,600	129,900	+7,300	133,250	153,400	+20,150
Hardwood	150,000	136,300	-13,700	158,500	159,600	+1,100
Cedar	14,900	15,700	+800	14,900	15,700	+800
Pine	8,100	5,700	-2,400	8,100	8,700	+600
Hemlock	6,600	5,200	-1,400	6,600	5,200	-1,400
Larch	2,800	1,600	-1,200	2,800	2,100	-700
Total	***305,000***	***294,700***	***-10,600***	***324,150***	***345,000***	***+20,550***

- **General forest (hardwood): Total hardwood harvest averaged over 5 periods less hardwood scheduled from DWA and OSFH in period one (before hardwood adjustment in DWAs).**
- **General forest (softwood) : Total softwood harvest averaged over 4 periods less softwood harvest scheduled from DWA and OSFH in period one.**
- **Cedar, Pine, Hemlock, and Larch are all 1st period levels.**
- **DWA and OSFH component of Total Forest are 1st period levels.**

(B) Total forest – Spatial

The change in AAC from the 1997 Management Plan to the 2002 Management Plan is provided in Table 10.1, Table 10.2 and Table 10.3.

Spruce-Fir-Jack Pine Annual Allowable Cut (AAC) Before Net-Down: General Forest

The softwood AAC before net down for the total forest increased from 133,250 m^3/yr in 1997 to 153,400 m^3/yr in 2002 (see table 10.2). This is an increase of 20,150 m^3/yr (15.3%). Part of this increase (12,850 m^3) can be attributed to increased activity in buffers, DWAs and OSFH. In period one (2002-2007), Management Plans will be produced for another 6,721 ha of DWAs along with Management Plan continuance of approval for 11,627 ha.

Hardwood Annual Allowable Cut (AAC) Before Net Down: Total Forest

The hardwood AAC before net down for the total forest increased from 158,500 m^3/yr to 159,600 m^3/yr (see Table 10.3). This is an increase of 1,100 m^3/yr (0.7%). The increase is attributed to increased harvesting in DWA and OSFH, and adjustment of hardwood harvest from DWA to account for hardwood overruns between 1997-2002 (see Appendix 9).

Table 10.2. Comparison of 1997 and 2002 Spatial Spruce, Fir, Jack Pine Annual Allowable Cut (before net down) for Total Forest.

Landbase	1997	2002	Difference
GENERAL FOREST	122,600	129,900	+7,300
BUFFERS	1,000	2,000	+1,000
DWAMU	8,800	18,600	+9,800
OSFH*	850	2,900	+2,050
TOTAL	***133,250***	***153,400***	***+20,150***

*** Exclusive of DWA Overlap.**

- **General forest (softwood) : Total softwood harvest averaged over 4 periods less softwood harvest scheduled from DWA and OSFH in period one.**
- **DWA and OSFH component of Total Forest are 1st period levels.**

Table 10.3. Comparison of 1997 and 2002 Spatial Hardwood Annual Allowable Cut (before net down) for Total Forest.

Landbase	1997	2002	Difference
GENERAL FOREST	150,000	136,300	-13,700
BUFFERS	100	100	0
DWAMU	7,200	20,500	+13,300
OSFH*	1,200	2,700	+1,500
TOTAL	***158,500***	***159,600***	***+1,100***

*** Exclusive of DWA Overlap.**

- **General forest (hardwood): Total hardwood harvest averaged over 5 periods less hardwood scheduled from DWA and OSFH in period one (before hardwood adjustment in DWAs).**
- **DWA and OSFH component of Total Forest are 1st period levels.**
- **DWA harvest adjusted due to 1997-2002 hardwood over runs (Table 6, Appendix 9)**

(C) Total forest – Spatial (After Net Down)

Annual Allowable Cut (AAC) After Net Down

During implementation of the 1997-2002 management plan, through the operational planning and harvesting phase, 82% of proposed harvest blocks got smaller (area harvested was less than proposed area). Area was lost from proposed harvest blocks for several reasons. Some area lost from proposed harvest blocks will be available for harvest in the future while other area will never be available for harvest. The decision

was made to net down the AAC to account for area that will be lost from harvest blocks but can't be identified at the Management plan level. The estimate of total area that will never be available for harvest is 8.9%. See Appendix 8 for further details. The softwood, cedar, pine, hemlock and larch from the general forest were netted down by 8.9%. The softwood from DWAMU and OSFH were netted down by 8.9% to account for losses in blocking. The softwood from buffers was not netted down. The hardwood from general forest, buffers, DWAMU and OSFH were not netted down. There was no net down on hardwood because hardwood yield in 1997-2001 still appears to be underestimated. Also buffer changes, unmapped streams, non-productive and inoperable areas are more associated with softwood strata. Table 10.4 shows the comparison between 1997 AAC and 2002 AAC after net down.

Spruce-Fir-Jack Pine Annual Allowable Cut (AAC) After Net Down: Total Forest

The spruce-fir AAC increased from 133,250 m^3/yr in 1997 to 139,800 m^3/yr in 2002 (see table 10.4). Spruce-fir AAC from the total forest is up 6,550 m^3/yr (4.9%) even though there is a loss of 4,300 m^3/yr from the general forest. The net increase in AAC can be attributed to increased activity in buffers, DWAs and OSFH, which contributes 1,000 m^3/yr, 8,100 m^3/yr and 1,750 m^3/yr of the increase, respectively.

Other Softwood Annual Allowable Cut (AAC) After Net Down: Total Forest

The cedar, pine and hemlock AAC for the total forest decreased from 29,600 m^3/yr to 26,900 m^3/yr after net down. See Table 10.4 for detail by species. As harvest is concentrated in the managed forest, the fall out of other softwoods (cedar, pine, hemlock) declines. In periods three, four and five, harvest in the managed forest will increases sharply.

10.3.2. Tolerant Hardwood

All tolerant hardwood (PT) and tolerant hardwood/softwood (TS) conditions with potential for quality production (future sawlogs and veneer) are managed using uneven-aged management techniques (selection cut). All tolerant hardwood (PT) and tolerant hardwood/softwood (TS) conditions with no potential for quality production are managed using even-aged management techniques (clearcutting, two-pass shelterwood or strip cut).

Table 10.4. Comparison of 1997 and 2002 Spatial Annual Allowable Cut (after Net Down) for Total Forest.

Forest Product	Total Forest		
	1997	2002	Difference
Spruce-fir	133,250	139,800	+6,550
Hardwood	158,500	159,600	+1,100
Cedar	14,900	14,300	-600
Pine	8,100	7,900	-200
Hemlock	6,600	4,700	-1,900
Larch	2,800	1,900	-900
Total	**324,150**	**328,200**	**+4,050**

- **8.9% net down in all softwoods; Exception no net down of softwood in buffers**
- **No net down of hardwood**

Table 10.5. Comparison of 1997 and 2002 Spatial Spruce, Fir, Jack Pine Annual Allowable Cut (after net down) for Total Forest.

Landbase	1997	2002	Difference
GENERAL FOREST	122,600	118,300	-4,300
BUFFERS	1,000	2,000	+1,000
DWAMU	8,800	16,900	+8,100
OSFH*	850	2,600	+1,750
TOTAL	***133,250***	***139,800***	***+6,550***

- **8.9% net down in all spruce/fir; Exception no net down of spruce/fir in buffers.**

10.3.3. Cedar and Pine

Cedar and pine strata are maintained through selection harvest or strip cut and selection harvest and patch shelterwood, respectively. It is anticipated that these treatments will maintain a cedar or pine overstory, and will encourage the establishment of cedar and pine ingrowth.

Concern: Red pine is an intolerant species that does not regenerate well naturally under the selection cut system. Although some success might be expected through patch shelterwood, it is felt that something extra will be necessary to ensure a future supply of red pine. To ensure red pine in the future a small planting program will be conducted.

10.3.4. Buffers

Riparian buffers are maintained. All buffers are available for enhancement through harvesting. Harvesting in buffers has been very limited in the past and is projected to be limited in the future. License 8 has many narrow buffers (small streams) that leave little area to harvest. Many buffers have low volume and basal area that restricts entry if 18 m^2 is to be maintained. The projected level of softwood harvest in buffers could increase from 1,000 m^3/yr to 2,000 m^3/yr.

10.3.5. Wildlife Habitat

a) OSFH:

The OSFH blocks are in the same areas as the MCFH Blocks in the 1997 Management Plan. OSFH levels supplied from the different OSFH landbases are summarized in table 4.2. The minimum level of 7,140 is not met until period three.

b) DWA:

In period one, the identified DWAs provide over 9,275 ha of Severe Winter Deer habitat. By year twenty-five, the identified DWAs are still providing more than 8,215 ha of Severe Winter Deer Habitat. The Moderate Winter Deer Habitat has a more positive development starting at greater than 8,075 ha in period one and going to 11,600 ha at the end of twenty-five years. From the timber side, these same DWAs will provide approximately 332,600 m^3 of softwood volume over the next twenty-five years.

10.3.6. Vegetation and Habitat Objectives

St. Anne has monitored, and where necessary made changes to the management strategy to meet vegetation and habitat objectives. See Appendix 6 for monitored levels.

10.3.7. Recreation

All existing recreational opportunities will be maintained. When the opportunity arises, recreation will be enhanced if it contributes to the public's enjoyment of Crown lands.

10.3.8. Unique Sites

St. Anne has identified several unique sites. St. Anne supports the preservation of these areas for future generations. St. Anne is prepared to investigate and support the preservation of proven unique conditions.

10.4. Conclusion

The Licensee has attempted to meet or surpass all objectives for the Management of License 8.